

*NATIONAL WETLAND MITIGATION
BANKING STUDY
Expanding Opportunities
for Successful Mitigation:
The Private Credit Market Alternative*

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[This work is among others of the National Wetland Mitigation Banking Study and represents an example of possible options for wetland mitigation banking. The findings and recommendations do not represent the position of the Department of the Army.]

National Wetland Mitigation Banking Study

This report is part of a series of reports which are being published during the National Study. General background information pertaining to wetland mitigation banking and the scope of the national study were the subjects of a report published during the first year of the study.

Wetlands Mitigation Banking Concepts IWR Report 92-WMB-1, prepared by Richard Reppert, Institute for Water Resources, July 1992, 25pp.

A number of reports presenting the results of the first phase of the National Study are expected to published in 1994, in addition to this report. Among these reports:

Wetland Mitigation Banks: A Resource Document IWR Report 94-WMB-2, prepared by the Environmental Law Institute and the Institute for Water Resources. This report presents bank-specific information obtained by the national study in its inventory of banks and detailed case study histories of 22 wetland mitigation banks. The report also includes an annotated wetland mitigation banking bibliography and a summary of study findings on fee-based compensatory mitigation.

First phase report IWR Report 94-WMB-4, prepared by Robert Brumbaugh and Richard Reppert, Institute for Water Resources. Summation of findings of phase one of the national wetland mitigation banking study and recommendations for the final study phase.

An Examination of Wetland Programs: Opportunities for Compensatory Mitigation IWR Report 94-WMB-5, prepared by Apogee Research, Inc. Sixty eight programs that conduct or facilitate wetland restoration or creation were identified that might be applicable to compensatory wetland mitigation. Fourteen programs with the greatest potential are profiled in more detail.

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ACKNOWLEDGEMENTS

This report was prepared as part of the National Wetland Mitigation Banking Study conducted by the Institute for Water Resources (IWR), U.S. Army Corps of Engineers. The study on private credit market alternatives was directed by Robert Brumbaugh, manager of the National Wetland Mitigation Banking Study. The Assistant Secretary of the Army for Civil Works was given authority for the study as provided in Section 307(d) the Water Resources Development Act of 1990.

The National Wetland Mitigation Banking Study is conducted within the IWR Policy and Special Studies Division, whose chief is Eugene Z. Stakhiv. This report and the national study has benefitted from Eugene Stakhiv's review and guidance throughout the course of the ongoing effort. Kyle Schilling is the Director of IWR. Richard Worthington has provided study oversight for the Directorate of Civil Works, Headquarters of the U.S. Army Corps of Engineers (HQUSACE).

We gratefully acknowledge the following individuals who provided information and personal viewpoints for this study through telephone and/or personal interviews: Joseph Agozino, Arthur Berger, Ken Bierley, Chet Bigelow, Kevin Carr, Cathy Chatman, Loren Clark, Douglas Davis, C.J. Ebbert, Oliver Edstrom, Carrie Fox, Douglas Frederick, Sarah Gannett, Edward Garbisch, James Griswald, Richard Hopen, Terry Huffman, David

John, Mark Krauss, Jon Kusler, James Levine, Robin Lewis, Richard Morgan, Robert Neil, Phillip Oshita, Ralph Pasquale, Dean Prigmore, John Reiger, Michael Rolband, Brooks Stillwell, Ron Stouffer, Elizabeth White, and Robert Will. In addition, comments on draft MOAs or permits for particular banks written by Donald Burgess, David Farrell, John Forren, Bradley Hartman, Andreas Mager, and Thomas Welborn were also reviewed as part of the study.

Finally, we gratefully acknowledge the helpful comments on an earlier version of this report provided by Robert Brumbaugh, Richard Reppert, and Eugene Stakhiv of the IWR national study team. Robert Brumbaugh also provided text on wetland assessment methodology that was incorporated in the main body of text and in Appendix I. Other very helpful comments were provided by Michael Davis and Julie Metz (Office of the Assistant Secretary of the Army, Civil Works), Jack Chowning (HQUSACE Regulatory Branch) Ralph Heimlich (then of U.S. EPA), Thomas Kelsch (U.S. EPA), and Robin Lewis (Tampa, Florida).

Clearly, we received different views and perspectives from these many people. Therefore, in the challenge of reflecting all viewpoints some are, of necessity, not represented in this report. As a result, the findings and conclusions of this report are the authors' alone and do not represent the views of those who were interviewed or commented on prior drafts.

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EXECUTIVE SUMMARY

This report: (1) explains the concept and functioning of private markets in wetland mitigation credits; (2) describes the potential for private credit markets to help the Federal wetland regulatory program achieve the national goal of no-net-loss in wetland function and acreage; and (3) explains the regulatory conditions necessary for the widespread emergence and ecological success of this mitigation alternative.

Mitigation credit markets are a special case of "mitigation banking". Mitigation banks are large areas of replacement wetlands created for the express purpose of providing off-site compensatory mitigation for more than one future wetland development project. The vast majority of mitigation banks in operation today are single-user banks; that is, each was developed by a single large public or private developer to provide only for its own future mitigation needs. By contrast, private mitigation credit markets would encourage entrepreneurs to establish commercial mitigation banks from which credits would be sold to wetland developers in need of compensatory mitigation. Such markets could help the nation achieve no-net-loss of wetlands by increasing the opportunity to obtain successful compensatory mitigation for permitted wetland losses.

On August 23, 1993 the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency issued guidance to their field offices on mitigation banking. The guidance, which was endorsed by the Clinton Administration's Wetland Plan, provides a policy framework and conditions for the use of mitigation banking.

On-Site Mitigation and Off-Site Mitigation Banking

The "mitigation sequencing" rules of the Federal wetland regulatory program require

developers (i.e., permit applicants) to first avoid and minimize wetland impacts to the extent practicable, and then mitigate any remaining impacts that cannot be reasonably avoided. Compensatory mitigation is expected in the form of wetlands created from uplands, the restoration of former or severely degraded wetland areas, or by enhancing the functioning of existing wetlands. These compensatory mitigations, which are expected to be constructed on-site (i.e., at the permitted site) if practicable, are called mitigation credits.

Although Federal wetland regulations emphasize the use of on-site mitigation to compensate for unavoidable wetland impacts, the rules provide that the use of off-site mitigation banks may be an acceptable alternative in certain situations. Mitigation banking offers the opportunity to obtain compensation for wetland impacts caused by multiple independent or linear development projects by locating a single, large-scale wetland mitigation project elsewhere in the watershed. Developers favor mitigation banking because it can reduce the costs and delays often associated with the permit review process. Regulators are interested in mitigation banking because of its potential ecological advantages. For example, mitigation banks typically involve large-scale replacement wetlands that can in many instances more effectively maintain ecosystem function than isolated on-site mitigation projects.

Despite the potential of off-site mitigation banking to increase the efficiency and effectiveness of wetland regulation, its use to date has been very limited. This is because traditional single-user banking arrangements are necessarily limited to those large public and private developers that routinely undertake many independent or linear development projects and can afford a substantial up-front investment in

compensatory mitigation. In addition, regulatory and resource agencies and the environmental community often have been reluctant to endorse mitigation banking because of the perception that it may lead to the "buying" of permits.

Private Versus Public Credit Markets

Mitigation credit markets offer the opportunity to increase the efficiency and effectiveness of compensatory mitigation by providing the banking option to a wider set of permit applicants. Indeed, toward this end a number of states and localities across the nation have established public commercial banks and public fee-based mitigation systems (sometimes referred to a "in-lieu" fee systems). Public commercial banks offer mitigation credits for sale to the general public, and use the proceeds from credit sales to recoup the costs of bank construction and management. Similarly, public fee-based systems charge permit fees for projects involving small wetland impacts in lieu of the direct provision of mitigation by permittees. Fee revenues are accumulated in trust funds for the intended future provision of replacement wetlands by the government entity.

While the broader establishment of these two types of public mitigation systems could potentially extend the advantages of mitigation banking to a wider set of permit applicants, important obstacles must first be overcome. One major problem for establishing public banks involves the substantial up-front public financing needed for bank construction and management. Public fee-based systems may also face financing problems since there is no guarantee that fee revenues accumulated in trust funds for replacement wetlands will not be diverted to other uses. Moreover, both types of public mitigation systems face the risk that fee revenues will be insufficient to cover the full costs of providing compensatory mitigation for the fill activity they serve.

Unlike commercial mitigation banking by public entities, a private credit market system would tap the profit motive to encourage private entrepreneurs to produce mitigation credits with private capital. If entrepreneurs emerge to sell credits to many possible buyers, a private market for wetland functions would develop. Market competition could ensure that mitigation credits were provided at least cost, and provide incentives for the further development of wetland restoration technologies as credit supply firms seek out more successful mitigation techniques.

The Benefits of Private Credit Markets

The most obvious benefit from private credit market systems is the opportunity to secure mitigation for the many small wetland impacts that would otherwise go unmitigated. For example, under general permits, compensatory mitigation is often not required when wetland alterations are so small that the possibility of on-site mitigation is deemed impractical or infeasible. The cumulative impact of many such small wetland losses is one cause of slippage from the no-net-loss goal. The widespread establishment of private credit market systems could correct this deficiency by making credits available for sale in small increments. Regulators could then require compensatory mitigation in cases involving small wetland impacts by having developers purchase equivalent credits from established private commercial banks.

Credit market systems could also have broader application to permitted development projects involving more significant wetland impacts. Current wetland regulations emphasize the on-site mitigation option in the hope that important site-specific wetland functions, such as stormwater retention and erosion control, will be retained at the site affected by the fill activity. However, wetland development projects also impact wildlife habitat and ecological "life-

support" functions which may be transferable to other locations within watersheds.

The opportunity to successfully replace lost habitat and life-support functions may often be improved by conducting mitigation away from the development site. For example, if the preference for on-site mitigation is applied in an inflexible manner, opportunities to obtain more environmentally desirable mitigation may be forgone. This can occur if permitting decisions pay too little attention to the possible fragmentation, isolation, and functional degradation of the wetlands preserved at the fill site and the replacement wetlands provided by in-kind and on-site mitigation.

Allowing the purchase of private market credits in certain cases, instead of requiring on-site mitigation, could also enable regulators to avoid the several institutional sources of failure associated with on-site mitigation. Foremost among these are problems of enforcement:

1. When permits are granted conditional on the provision of mitigation, typically "on-site and in-kind", often no compensation effort is ever made.
2. If mitigation is initiated, regulators often do not have the time to check the mitigation plans for technical quality and feasibility or to check the construction practices which execute plans.
3. Often there are too few resources to allow for regulatory monitoring of mitigation projects that are constructed.
4. If a mitigation project is monitored and determined to have failed, there may be no responsible party liable for rectifying that failure.
5. If a mitigation project is constructed and judged successful in the short term, often there is no assurance that the mitigation site

will be maintained as a wetland into the future.

The credit market alternative could greatly reduce the institutional and ecological sources of on-site mitigation failure inherent in the current regulatory program by leading to the following outcomes.

1. Private credit markets would tap and combine mitigation expertise, planning, and capital in a manner that is typically not possible with on-site mitigation projects. Then if a permit applicant had the option of buying credits from an established bank that had already planned for or provided replacement wetlands, there would be less chance that the permit applicant's compensatory mitigation requirement would go unfulfilled.
2. The consolidated mitigation projects provided by private banks would enable the regulatory agency to concentrate its limited oversight and monitoring resources on a much smaller number of mitigation sites.
3. Regulators would have more leverage and a greater variety of tools for imposing cost liability for mitigation failure in the banking option since regulators could dictate the conditions under which banks could be utilized.
4. Private banks would reduce the problem of ecologically vulnerable mitigation sites by consolidating what would otherwise be many isolated and fragmented on-site mitigation projects into a relatively few areas of replacement wetlands that could be sited and constructed according to watershed goals.
5. The increased likelihood of successful replacement wetlands and available mitigation credits would make the evaluation of permit applications more focused on issues concerning the need for the permit and the

ecological value of the impacted wetland if the permit is or is not granted.

Indeed, these advantages have been recognized by entrepreneurs and wetland regulators in many areas of the country, and two private commercial mitigation banks--the "Millhaven Plantation Bank" in Screven and Burke counties, Georgia, and the "Florida Wetlandsbank" in Pembroke Pines, Florida--have already obtained Federal permission to create and sell mitigation credits under the Section 404 regulatory program. Moreover, across the nation the challenge of creating regulations conducive to private credit market systems is actively being discussed in a number of states and localities.

Necessary Conditions for the Emergence and Success of Private Credit Markets

The two newly-permitted and a dozen or so prospective credit suppliers (i.e., private commercial bankers) across the country were interviewed as part of this study. They expected a strong demand for this alternative way of satisfying mitigation requirements provided that it could be made acceptable to regulatory and resource agencies. The study interviews generally suggest that a ready supply of mitigation credits would emerge from entrepreneurs in many areas of the country provided that the conditions for market operation established by regulators enabled credit suppliers to earn a competitive return on investment.

But wetland regulators have legitimate concerns about whether the bank mitigation projects from which credits are sold will succeed over time. The emergence of the private market alternative and its ability to improve the effectiveness of compensatory mitigation depends on the capacity of regulators to fashion trading and regulatory rules that provide enforceable environmental safeguards without being cost-prohibitive.

This report describes in detail the types of trading and regulatory rules that could be used to promote the establishment and use of private credit market systems to simultaneously satisfy the goals of regulators, permit applicants, and private credit suppliers. Its conclusions and recommendations for facilitating the emergence and success of private commercial banking center around seven major themes:

- **Allow Early Credit Sales**

Regulator concerns about allowing the use of private credit markets to satisfy mitigation requirements center around the risk of mitigation failure. This concern may tempt regulators to require private commercial bank mitigations to be in place and fully functioning before they could be used as compensatory mitigation. Use of this risk-minimizing strategy in the credit market context would force private banks to bear the full costs of waiting for the maturation of replacement wetlands (i.e., opportunity costs of invested capital) as well as all failure risk costs. However, these costs would probably be too high for most private commercial mitigation banks to earn a competitive return on investment. If a market-based trading system is to operate, there must be opportunities for private banks to sell credits before replacement wetlands reach functional maturity or self-maintenance, and in some cases, perhaps even at the time mitigation is initiated. Early credit sales may be warranted when the bank site and mitigation plan (including expertise) is favorable for mitigation success, and bank rules have been established to limit failure risk and allocate cost liability for failure.

- **Establish Bank Standards for Performance, Monitoring and Maintenance, and Long-Term Management**

Regulators must clarify in advance the "contract" conditions for credit suppliers in "Memoranda of Agreement" and/or regulatory permits. The agreements recorded in these contracts should specify (in addition to bank siting, design, and construction specifications): performance standards that define the conditions under which mitigation projects would be judged successful; monitoring and maintenance requirements to detect and correct deficiencies and; provisions to ensure long-term site management. Performance standards should provide some leeway to account for less-than-extreme natural events which might cause bank mitigations to evolve along somewhat different paths than originally planned.

- **Allocate Cost Liability for Mitigation Failure**

In order to ensure mitigation quality control while maintaining the economic viability of private credit markets, regulators should allocate to credit suppliers those failure risk costs resulting from non-performance with contract requirements regarding the design, performance, and management of mitigation projects, but not for extreme events (e.g., a catastrophic hurricane) which prevent credit suppliers from fulfilling contract obligations.

- **Assure that Liability Rules Reflect Realistic Failure Probabilities and Repair Costs**

There are a variety of mechanisms that could be included in the contracts for mitigation suppliers to allocate cost liability for mitigation failure. These mechanisms, which

include higher trading ratios, performance bonds, leases with collateral banks, and insurance systems, should be viewed as substitutes for each other whose use could vary by situation. Moreover, the level of risk cost (i.e., financial assurance) established by liability rules in any particular mitigation case must be reasonable in consideration of realistic failure probabilities and repair costs for that case.

- **Establish Rules for Credit Valuation and Trading**

The establishment of private commercial credit market systems requires that the type and level of wetlands functions and ecological values at the bank site be specified. Only if such a functional assessment is conducted will it be possible to judge how many credits have been created for sale. Bank specific rules should be established for determining how credits will be defined and their level assessed. There are several methods which have been used in mitigation decisions for defining mitigation credits and determining the compensation needed when granting a permit. Current banking experience shows that there are as many ways in which such methods can be used as there are different banks. Additional development of these assessment techniques for *all* types of permit and mitigation decisions should be expected.

In addition, rules are needed to define the types and sizes of wetland development impacts for which credits can be used to provide compensatory mitigation, as well as the geographic service area of banks. As with credit definition and evaluation, rules defining bank market and service area would necessarily depend on case- and area- specific factors and goals.

- **Make Regulatory Reforms to Enhance Market Trading**

The benefits of private credit markets would be maximized if a sufficient number of credit supply firms enter the market, making the supply of credits adequate for mitigation needs. To encourage market entry there must be consistency in the mitigation requirements for banks and on-site mitigation projects; there should be no price controls placed on credits produced by private commercial banks and; the market area over which credits may be sold should not be too narrowly proscribed.

Finally, **if** private banks are to be encouraged, public banks and in-lieu fee systems should establish full-cost pricing of credits to ensure that such public mitigation systems do not subsidize wetland development and undercut the private credit market alternative.

- **Incorporate Credit Markets into Watershed Planning and Management**

If the wetland regulatory program were integrated with regional or local watershed planning initiatives, the feasibility and success of private credit markets could be improved.



I. INTRODUCTION

National wetland policy has advanced significantly over the twenty years since wetland protection emerged as a national environmental concern. It is now generally agreed that wetland functions are worthy of protection and even enhancement from current levels. This has led to acceptance of a national goal of no-net-loss in wetland acreage and function in the short term, to be followed by net gain as the long-term goal of Federal wetland policy. Toward this end the nation has sharply reduced the primary source of wetland loss--agricultural conversions--in part through policy actions designed to reduce the economic return of these activities. Further, a variety of Federal and state wetland restoration programs have been authorized and are operating. One report estimates that since 1989 over one million acres of former wetlands were restored by Federal programs alone (Interagency Committee on Wetlands Restoration and Creation, 1992). Meanwhile, continuing efforts to clarify and improve the Federal regulatory program, the Clean Water Act Section 404 permit program, and similar state programs, have helped to define their purpose and scope and reduce wetland loss.

Yet, controversy and debate continues to surround the Section 404 permit program. Even the question, "what are the boundaries of a wetland?"--which is critical for defining the geographic extent of regulatory jurisdiction--has not yet been definitively answered. Moreover, the program's stakeholders often appear dissatisfied with various other aspects of the method and results of the regulatory program in its current form. Private property and development interests focus largely on the need to improve program efficiency. They argue that regulatory procedures are too inflexible and cumbersome, leading to unnecessary costs and delays in wetland permitting. Environmental advocates, on the other hand, focus on the need to improve the program's

effectiveness for maintaining wetland acreage and function. One of their arguments is that the compensatory mitigation requirement of the existing program is not advancing the no-net-loss goal.

Recently, the Clinton Administration and Congress (several bills) proposed program reforms (White House Office of Environmental Policy, 1993). One Administration proposal concerns the "compensatory mitigation" provision of wetland regulations. These regulatory provisions, discussed in detail later in this report, require that once permit applicants have made all practicable efforts to avoid and minimize wetland impacts, they must then provide compensatory mitigation for those wetland impacts that cannot be reasonably avoided. Compensatory mitigation is expected in the form of wetlands created from uplands, the restoration of former wetland areas, or the enhancement of functional wetlands. These compensatory mitigations, which are expected to be constructed "on-site and in-kind" if practicable and environmentally desirable, are called mitigation *credits*. In effect, compensation requirements trade impacted wetland functions for the functions of replacement wetlands at the permitted site.

The regulatory requirement for compensatory mitigation is warranted by the no-net-loss goal. Unfortunately, the record of success for on-site mitigation is spotty, and there is widespread concern that net losses of jurisdictional wetlands are continuing (see: Redmond, 1990; Erwin, 1991, National Research Council, 1992).

To help remedy this problem, the Administration Wetland Plan supports the greater use of *mitigation banking* to obtain compensation for permitted wetland impacts. Mitigation banks are large areas of replacement wetlands created for

the express purpose of providing off-site compensatory mitigation for more than one wetland development project, often in advance of project impacts. Mitigation banking can reduce the costs and delays associated with the permit review process, and the large-scale replacement wetlands provided by banks can often more effectively maintain ecosystem integrity than several isolated, on-site mitigation projects. The Clinton Administration Wetland Plan, noting that "...conceptually, mitigation banking, with appropriate environmental safeguards, offers numerous advantages", says that Congress should explicitly endorse the use of banking in the forthcoming reauthorization of the Clean Water Act. On August 23, 1993, the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency issued guidance to their field offices on mitigation banking. The guidance, which was endorsed by the Administration Wetland Plan, provide a policy framework and conditions for the use of mitigation banking.

A. The Private Credit Market Alternative

This report: (1) explains what a private credit market is; (2) describes the potential for private markets in mitigation credits to help the Federal wetland regulatory program achieve the national goal of no-net-loss in wetland function and acreage; and (3) explains in detail the necessary regulatory conditions for their widespread emergence and ecological success. The report was prepared as a contribution to the U.S. Army Corps of Engineers Institute for Water Resources (IWR) "National Wetland Mitigation Banking Study". The larger IWR study includes a survey and analysis of the universe of existing mitigation banks, and explores possible new opportunities for the use of mitigation banking in the Federal wetland regulatory program (IWR, 1994). The findings and recommendations presented in this report, however, are the authors and do not necessarily represent the position of the Department of the Army.

Private credit markets are a special case of mitigation banking which could help the nation achieve no-net-loss of wetlands by increasing the opportunity to obtain successful compensatory mitigation for permitted wetland losses. The vast majority of mitigation banks in operation today were each developed by a single large public or private developer to provide only for its own mitigation needs. These traditional single-user banking arrangements are necessarily limited to those large public and private developers that routinely undertake many independent or linear development projects and can afford a substantial up-front investment in compensatory mitigation. By contrast, private credit market systems would develop if entrepreneurs were encouraged to establish "commercial" banks to create mitigation credits for sale to the general universe of permit applicants in need of compensatory mitigation. Private credit markets offer the opportunity to increase the efficiency and effectiveness of compensatory mitigation by providing the banking option to a much wider set of permit applicants.

Private mitigation credit markets would tap the profit motive to encourage private entrepreneurs to produce mitigation credits with private capital. If entrepreneurs emerge to sell credits to many possible buyers, a private market for wetland functions would develop. Market competition could ensure that mitigation credits were provided at least cost, and provide incentives for the further development of wetland restoration technologies as credit supply firms seek out more successful mitigation techniques.

Federal regulators point out that to maintain the credibility (and ultimate success) of private credit market banks, the use of mitigation banks will be allowed only when it is environmentally desirable and consistent with applicable mitigation policies.

B. The Benefits of Private Credit Markets

The most obvious benefit from private credit market systems is the opportunity to secure mitigation for the many small wetland impacts that would otherwise go unmitigated. For example, under many general permits, compensatory mitigation is often not required when individual wetland alterations are so small that the possibility of compensation for loss is deemed impractical or infeasible. The cumulative effect of many such small wetland losses, and as a result of limitations in state regulation of wetlands that fall outside Federal jurisdiction, might be judged to be a cause of slippage from the no-net-loss goal. If this was determined, the widespread establishment of private credit market systems could correct this deficiency by making credits available for sale in small increments. Regulators could then require compensatory mitigation in cases involving small wetland impacts by having developers purchase equivalent credits from established private commercial banks.

Credit market systems could also have broader application to regulated development projects involving more significant wetland impacts. Current regulations emphasize the on-site mitigation option in the hope that important site-specific wetland functions, such as stormwater retention and erosion control, will be retained at the site affected by the fill activity. However, wetland development projects also impact wildlife habitat and ecological "life-support" functions which may be transferable to other locations within watersheds.

In fact, the opportunity to successfully replace lost habitat and life-support functions may often be improved by conducting mitigation away from the development site. For example, if applied in an inflexible manner, the mitigation sequencing rules of the regulatory program--which require permit applicants to avoid, minimize and mitigate wetland impacts on-site--may limit the possibility of successful mitigation (as well as wetland preservation). This can occur if permitting

decisions pay too little attention to the fragmentation, isolation and functional degradation of wetlands preserved as a result of avoidance and impact minimization, or of wetland replacements provided by on-site mitigation efforts. Commercial and residential development twisting among preserved wetlands are the product of regulatory rules which stress wetland avoidance and impact minimization. And wetlands in the midst of concrete parking lots are the product of the regulatory preference for on-site compensatory mitigation. As a result, many preserved and replacement wetlands have diminished ecological functions from polluted runoff, changes in hydrologic regimes, and the fragmentation of the landscape which often isolates wetlands from surrounding uplands, waters, and biological resources of the watershed. The important implication is that when wetland functions lost as a result of permitted development are largely transferable within the watershed, it may be desirable to secure compensatory mitigation through private commercial banks.

Allowing the purchase of private market credits, instead of requiring on-site mitigation, in certain cases could enable regulators to reduce the prospects of failure of on-site mitigation efforts. Mitigation failure occurs when a permit is granted with the expectation that compensatory mitigation will be made, typically on-site and in-kind, but either no compensation effort is ever made or there is poor quality mitigation. There have been several sources of mitigation failure with respect to the large number of on-site mitigation projects required by the regulatory program. These include:

1. Insufficient technical expertise in regulatory agencies to adequately evaluate and finalize a large number of diverse mitigation plans;
2. Lack of regulatory resources to oversee and enforce mitigation construction, and to conduct site monitoring over time;

Introduction

3. Difficulty in imposing financial assurance requirements or other liability mechanisms to account for the possibility of mitigation failure;
4. Vulnerability of isolated and fragmented replacement wetlands to functional degradation; and
5. Lack of assurance that successful mitigation sites will be maintained as wetlands into the future.

To understand how mitigation failure is possible it is useful to describe the existing demand for the on-site provision of mitigation credits. Permit applicants for projects involving significant wetland alterations often hire mitigation consultants to help them file permit applications and propose, design, and construct mitigation projects. In effect, these consultants sell a service of compensatory mitigation to permit applicants. The quality of that service demanded by the permit applicant is determined by the degree of oversight on the compensatory mitigation requirement exercised by the regulatory agency. If the only condition on an issued permit to develop a wetland is that there be a regulator-approved plan for mitigation, then once the permit is issued there is a limited incentive for the permit applicant to go beyond this "paper mitigation". If the regulatory agency monitors the progress of the mitigation and has some enforcement tools to ensure that it is done, then mitigation is more likely to be initiated.

However, even if the mitigation is initiated, regulators often do not have the necessary technical expertise or the time to check the feasibility and quality of mitigation plans, or to check the construction practices which execute the plans. Then, even if these early checks are accomplished, often there are too few resources to provide for regulatory monitoring of mitigation sites. And, if replacement wetlands are monitored and determined to have failed, often there is no

specified responsible party liable for rectifying that failure. Finally, even if replacement wetlands are successful in the short term, often there is no assurance that mitigation sites will be maintained as wetlands into the future.

Given this variety of enforcement problems attributable largely to limited resources in the regulatory agency, the skepticism often expressed about compensatory mitigation is understandable. It is these institutional failures which are the cause of much mitigation failure, despite the often cited criticism of the current state-of-the-art in the science and engineering of wetlands restoration and creation. The sources of on-site mitigation failure could be offset in part by giving permit applicants the option of providing compensatory mitigation through private credit markets.

A credit market policy begins with the recognition that permit applicants want wetland development permits but have no particular long-term interest in wetlands. The regulatory agency, on the other hand, wants to protect and restore the ecological functions of watersheds and has no central interest in the development projects of permit applicants. Meanwhile, wetland restoration firms want to profit by creating mitigation credits for sale to permit applicants, and at the same time have the quality of their work acknowledged by regulators (in order to advance their future prospects in the credit supply business). These different objectives have the potential for negotiations that can make **all** interests better off, which is the essence of markets.

The private credit market alternative, if carefully structured, offers a competitive economic return on investment to private restoration firms and an expedited permit review process for many permit applicants. Most importantly, credit trading would benefit the public by increasing the opportunity to obtain successful compensatory mitigation for permitted wetland losses.

Specifically, the credit market alternative would lead to the following outcomes which are essential for attainment of the no-net-loss goal.

1. Private credit markets would tap and combine mitigation expertise, planning, and capital in a manner that is not possible with on-site mitigation projects for many permit applicants. Then if a permit applicant had the option of buying credits from an established bank that had already carefully planned for or provided replacement wetlands, there would be less chance that the permit applicant's compensatory mitigation requirement would go unfulfilled.
2. The consolidated mitigation projects provided by private banks would enable the regulatory agency to concentrate its limited oversight and monitoring resources on a much smaller number of mitigation sites.
3. Regulators would have more leverage and a greater variety of tools for imposing cost liability for mitigation failure in the banking option since regulators could dictate the conditions under which banks could create and sell credits.
4. Private banks would reduce the problem of ecologically vulnerable mitigation sites by consolidating what would otherwise be many isolated and fragmented on-site mitigation projects into relatively few areas of replacement wetlands that could be sited and constructed according to watershed goals.
5. The reality of successful replacement wetlands and available mitigation credits would make the evaluation of permit applications more focused on issues concerning the need for the permit and the ecological value of the impacted wetland if the permit is or is not granted. These important permitting issues would then be divorced from concerns about the possibility and likelihood of successful mitigation.

Indeed, these advantages have been recognized by entrepreneurs and wetland regulators in many areas of the country, and two private commercial mitigation banks--the "Millhaven Plantation Bank" in Screven and Burke counties, Georgia, and the "Florida Wetlandsbank" in Pembroke Pines, Florida--have already obtained Federal permission to create and sell mitigation credits under the Section 404 regulatory program. And, across the nation the challenge of creating regulations conducive to private credit market systems is actively being discussed in a number of states and localities.

There are localities and circumstances where credit markets cannot improve prospects for successful mitigation. Where suitable restoration sites or sources of water for wetland restoration projects are not available, for example, producing mitigation credits may be impossible. Where wetland development is not profitable enough for permit seekers to afford high-quality mitigation the demand for credits may be too small for the credit market alternative to succeed. However, prospects for successful mitigation credit markets are limited in most cases by the same geo-physical and economic conditions that limit opportunities for successful mitigation of any kind. In general the opportunities for mitigation credit markets to help further the no-net-loss goal exist wherever mitigation is viewed as an acceptable alternative to prohibiting all wetland development.

C. Study Objectives and Approach

This report describes the results of an analysis of the potential for using mitigation credit market systems to increase the success of compensatory mitigation under wetland regulatory programs. The specific objectives of the study were to:

1. Describe the general operation of and economic forces and regulatory policies affecting private markets in wetland mitigation credits;

2. Explain the types of trading rules necessary to promote the economic viability of credit markets systems while limiting and allocating the risk of mitigation failure; and
3. Investigate and recommend regulatory reforms which could enhance the ability of credit market systems to help the nation achieve the no-net-loss and net gain wetland goals.

The study began with the development of an analytical framework to examine how regulatory policies might affect the economics of private credit markets. The model resulted in several working hypotheses relating to the ability of private credit markets to operate under alternative trading and regulatory rules. With these hypotheses in mind, questions were developed which served as the structure for interviews with a variety of stakeholders in wetland regulation across the country, including prospective private credit suppliers (the terms credit suppliers and commercial mitigation banks are treated as synonyms and used interchangeably throughout this report), mitigation consultants, and Federal, state, and local wetland regulators and resource agency officials. Interviews with prospective credit suppliers included entrepreneurs in various stages of developing commercial mitigation banks. Some of the prospective credit suppliers had already developed carefully considered bank proposal and were actively negotiating bank agreements with regulators, while others were just beginning the planning process. During the course of the study, the Millhaven Plantation bank and Florida Wetlandsbank secured Federal permits authorizing credit sales. The regulators and resource agency field staff interviewed for this study came from the specific areas in which the newly-permitted and prospective commercial banks are located and from states and localities which have recently incorporated or are considering incorporating rules for credit market systems within their wetland programs.

The perspectives and experiences of the interviewees were used to modify and confirm the working hypotheses, refine the analytical framework, and develop findings and recommendations on how trading and regulatory rules could be fashioned to promote the emergence and ecological success of private credit markets. A general discussion of the interview results is found in Appendix II.

D. Plan of the Report

Section II briefly reviews the compensatory mitigation requirements of wetland regulations, the ability to evaluate wetlands as part of the compensatory mitigation requirements, and recent developments in mitigation policy and practice. This section also discusses the private credit market alternative in greater detail, and examines how market forces and various credit trading rules can affect the supply of and demand for mitigation credits. The trading rules include a set of bank requirements and conditions on trades which must be met before credits can be created and sold.

Section III examines how the trading rules governing private credit markets could be fashioned to promote the economic viability of credit market systems and manage the risks of mitigation project failure. The central conclusion is that the widespread emergence of private credit market systems hinges on allowing credits sales to occur before bank wetlands have reached functional maturity or self-maintenance. However, allowing such early credit sales without adequate safeguards would increase the risk of mitigation project failure borne by the public. Other trading rules which can be used to minimize and allocate the risks of mitigation failure are then described.

Section IV discusses regulatory policy reforms which could enhance the benefits of credit

trading systems. The primary recommendation is to reduce barriers to market entry by private mitigation supply firms. Also, greater flexibility in the Federal permit review process could advance private credit markets if mitigation sequencing rules were part of a comprehensive wetlands watershed planning process.

Section V, the conclusions, identifies the key considerations that should be included in any regulation and guidance for the establishment and

use of private credit markets. Appendix I discusses key conceptual issues relating to the valuation and trading of mitigation credits. Finally, Appendix II provides a summary review of the general perspectives on private credit markets uncovered in the study interviews with existing and prospective credit suppliers, wetland regulators, and resource agency field staff. The expectations and concerns of these parties regarding credit market systems are discussed here.

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II. WETLAND REGULATION AND MITIGATION CREDIT MARKETS

The principal Federal program regulating wetlands evolved pursuant to Section 404 of the Federal Water Pollution Control Act Amendments of 1972. Building on or expanding beyond the Section 404 program, many states also administer wetland protection programs for areas which do not fall under Federal regulatory jurisdiction. The content and recommendations of this report relating to mitigation credit market systems and regulatory reforms refer directly to the Section 404 program, but are equally applicable to state programs. In fact, several states are currently developing, and Florida and Maryland have already enacted, legislation which relates directly to the topic of this paper: the establishment and use of private credit market systems as part of wetland regulation.

A. The Section 404 Program

The Section 404 regulatory program requires permits for activities involving the discharge of dredge or fill material into "Waters of the United States", which includes most wetlands. The permitting process seeks to ensure that activities associated with discharges into wetlands proceed only if they are in the public interest and comply with certain environmental standards.

The program is administered jointly by the U.S. Army Corps of Engineers (the "Corps") and the U.S. Environmental Protection Agency (EPA), with advice from the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. The Corps handles the day-to-day program administration, including reviewing and deciding upon standard "individual" permit applications. Among other responsibilities under the program, the EPA developed the environmental standards by which the Corps judges individual permit applications--the Section 404(b)(1) guidelines, and

also shares enforcement responsibility with the Corps.

The Corps also issues "general" permits authorizing classes of activities which are similar in nature and deemed, individually and cumulatively, to result in no more than minimal adverse environmental effects. General permits do not require detailed project-specific review by the Corps and can be issued on a nationwide, regionwide, or statewide basis.

1. Mitigation Sequencing: The Section 404(b)(1) guidelines set out the environmental criteria that must be satisfied before an individual permit can be granted. These so-called "mitigation sequencing" rules set out three requirements for permits granted under the regulatory program. The first requirement says that no discharge can be permitted if there is a practicable alternative to the proposed development that would have less adverse impact on the aquatic environment. For the determination of which discharges to *avoid*, the guidelines create a presumption that practicable alternatives are available for any project that is not "water-dependent." However, it is also the case that the alternative is usually expected to be one that is available to the permit applicant.

The mitigation sequencing rules spell out two more criteria that must be met in succession once the Corps determines that the proposed project of a permit applicant cannot reasonably be expected to avoid a wetland area. The second step in sequencing states that discharges into wetlands can be permitted only when permit applicants take all "appropriate and practicable" steps to *minimize* unavoidable wetland impacts. Permit applicants must then *compensate* for those wetland impacts remaining after all appropriate and practicable efforts have been made to avoid and minimize projects impacts. Compensation may be provided by restoring former wetlands, enhancing existing

wetlands, and the creation of wetlands from uplands. To simplify discussion, the term "restoration" is used throughout this report to describe all types of mitigation compensation although it actually refers to a specific type of compensatory action.)

2. Compensatory Mitigation: In 1990 the Army and the EPA signed a Memorandum of Agreement (MOA) clarifying, among other things, the procedures to be used in determining when compensation is required, and the types and levels of compensation necessary to comply with the Section 404(b)(1) guidelines. It specifies that the compensation requirement can be met through efforts to restore, enhance, or create wetlands that replace the wetland functions lost as a result of permitted projects. The MOA specifies a preference for mitigation to be on or nearby the permitted areas and to be wetlands of the same kind--this is the so-called "on-site, in-kind" preference.

The MOA also establishes a minimum one-to-one replacement ratio for wetlands functions to advance the no-net-loss goal. Critical to establishing a replacement requirement is the protocol for assessing the functions and ecological values lost from the fill activity and the functional values that might be realized at the replacement wetlands site. Without such analysis, the determination of whether trading a permitted site will achieve no-net-loss can not be made.

As the Section 404 program has grown, advancements in the sophistication of the protocols for functional wetlands assessment have followed. However, the state of the art in wetlands functional assessment is still in its experimental stage and the approaches to functional assessment vary greatly across permit decisions. One alternative has been to establish the assessment and make permit trades according to wetlands types (ex. emergent shrub, bottomland hardwood, etc.). The implication of

this approach is that an acre of the wetlands "type" can be traded for another acre of that same "type". Some adjustment for an expected difference in functional value may be made if the replacement wetland is newly constructed or restored and the filled wetlands was an ecologically mature site. In such cases the compensation may be to require more than one acre of the replacement wetlands for the mature site (King, Bohlen and Adler, 1993). In other cases, compensation requirements have been adjusted upwards to account for failure risk or to advance net gain, going beyond no-net loss. The special considerations which must be considered in establishing credit valuation and "trading ratios" are further explored later in this Section and in Appendix I.

3. Regulatory Flexibility and Compensatory Mitigation: In the regulatory review of any individual permit application, regulators have the flexibility to scale the regulatory response according to the functional level of the wetland, the nature of the proposed discharge, and the potential environmental impact of the proposed discharge. It is likely that the degree of regulatory flexibility exercised in the permitting review process varies significantly by region, however, since the Section 404 program is administered by a number of Corps districts and EPA regional offices around the country. For example, less flexibility is probably exercised in areas of the country characterized by few remaining wetlands and strong development pressure.

Regardless of how much regulatory flexibility exists in any given region, however, the mitigation sequencing rules require that permit applicants must first make all practicable efforts to avoid and minimize project impacts before compensatory mitigation is even considered in the granting of permits. Thus, for example, regulators would be required to deny a permit for a project that would produce significant wetland impacts if a less damaging practicable alternative for the project were available, even if the permit applicant offered

to provide compensatory mitigation that clearly would more than offset the wetland impacts of the proposed discharge.

B. Wetland Assessment

Compensatory mitigation requirements are established by assuring that the wetland functions lost at the permitted site are replaced by the functions made available at the compensation site. The functions available at the compensation site are termed "mitigation credits". Mitigation credits are measures of the increase in wetland functional value achieved at the mitigation site, in excess of the functional value the site would have had without any wetland creation or restoration effort. Clearly, having protocols to establish the mitigation credits from the compensation wetland, as well as the functional value losses at the permitted site, are critical to determining whether compensation will achieve no-net-loss.

Wetland functional assessment requires: (1) predicting the effects of human activity on the components and properties of the wetland being affected and on the wetland site being created or restored; and (2) relating these predicted properties to positive and negative changes in the surrounding ecosystem. Assessment methods that offer a strong predictive capability have yet to be developed as part of a far-reaching research program (Zedler and Kentula, 1986; Bedford and Preston, 1988; The Conservation Foundation, 1988).

Indeed, the development **and** application of ecological theory has not kept pace with the needs of society to make effective resource allocation decisions (National Research Council, 1986; Baskerville, 1986). Wetland assessment tools have been no exception. There are many unknowns and considerable uncertainty surrounding even those key ecosystem--and wetland--properties that are thought to be well understood, at least in a theoretical sense. The

Conservation Foundation (1988) summarized the incomplete and uncertain information on wetlands:

The information currently available about wetlands is often incomplete and uncertain. An effective wetlands protection and management program demands better information about how wetland ecosystems operate, how they perform their diverse functions, how these functions should be measured, how wetland values and ecosystem stability are affected by various types of threats, and a host of factors related to the characteristics of the resources.

Nonetheless, a range of practical wetland assessment approaches have been developed to organize and synthesize available information and expert judgement in order to do necessary wetland assessments (See Appendix I). These methods have been criticized by scientists (Preston and Bedford, 1988), but for the most part, regulators and practicing environmental planners are very satisfied with practical utility of these methods (Kusler and Rexinger, 1986).

Wetland scientists recognize the need for practical assessment tools. However, many feel that, while the information included to support the assessments methods may well be weak (but still the best available), the methods do not incorporate that information into an assessment of a wetland's place within a surrounding landscape and ecosystem, especially as related to habitat (life support) functions. These critics would point out that there are some aspects of the relationships between wetland sites and surrounding landscapes (and characteristics such as wetland patch size, density, and connectivity) that can and should be made part of the assessment process (Stakhiv, 1991).

In particular, the wetlands assessment protocol must recognize the cumulative ecological effects of a permitted wetland loss to be sure that the mitigation wetland offers full compensation (Stakhiv, 1988; 1991). Cumulative effects can be taken into account by focusing on the landscape scale (Harris, 1988; Whigham et. al., 1988;

Brinson, 1988; Klopatek, 1988; and Lee and Gosselink, 1988). Some point out that a landscape-objective approach to wetlands evaluation might be preferred rather than an approach that amalgamates wetland values essentially focusing only on ecological properties (Stakhiv, 1991).

Wetland assessments generally have focused narrowly at the site level on specific wetland functions, such as particular fish and wildlife habitat, or on an amalgamation of a limited suite of wetland functions. However, in other cases, mitigation analyses, and the resulting compensation requirements in the permit that was issued have been based on creative ways to assess wetland functions directly or indirectly, landscape considerations notwithstanding.

If watershed goals focus on a suite of wetland functions, then credit valuation protocol can be built around an assessment method capable of evaluating such a range of functions (e.g., the "Wetland Evaluation Technique"). If, on the other hand, watershed needs focus primarily on wildlife habitat, this might dictate the use of a narrowly-defined assessment method based on that wetland function (e.g., the "Habitat Evaluation Procedures"). Both approaches are useful for evaluating compensatory mitigation requirements involving like wetland types, and might also be tailored to evaluate trades of dissimilar wetlands when such out-of-kind compensatory mitigation would contribute to watershed goals. Alternatively, if watershed needs dictate in-kind compensatory mitigation, credit valuation might be based on a more simplified method for subjectively scoring acres of like wetland types.

C. Mitigation Alternatives

Although the 1990 MOA emphasizes the use of on-site mitigation to compensate for unavoidable wetland impacts, it recognizes mitigation banking as an acceptable alternative

under specific criteria designed to ensure mitigation success. Interim national guidance for the establishment and use of wetland mitigation banks under the 404 program was issued jointly by the EPA and the Corps to their field offices on August 23, 1993. The guidelines define mitigation banking as "...the restoration, creation, enhancement, and, in exceptional circumstances, preservation of wetlands or other aquatic habitats expressly for the purpose of providing compensatory mitigation in advance of discharges into wetlands permitted under the Section 404 regulatory program."

The interim guidelines, as well as earlier draft and final guidance documents produced by various EPA regions and Corps districts, stress that regulators should require the establishment of bank sites in advance (i.e., in place and functioning) of project impacts. Once a bank is certified for use by regulators, it provides mitigation credits that can be traded for units of permitted wetland loss. As wetland losses are permitted by the regulatory agency, debits are made to the bank, reducing its credit balance. The terms by which credits can be traded for units of permitted wetland loss--the *trading or compensation ratio*--is typically set by regulators to achieve no-net-loss in wetland function and acreage.

Mitigation banking offers the opportunity to obtain compensation for the loss of wetland functions caused by multiple independent or linear development projects through a single, large-scale wetland mitigation project located elsewhere in the watershed. Banking has several advantages.

- Banking provides large-scale restorations and long-term management that can more effectively maintain ecosystem integrity than isolated, on-site mitigation projects.
- Banking, by providing pre-planned or advanced replacement wetlands, reduces intertemporal losses of wetland functions and increases the certainty that compensatory mitigation will be realized.

- Banking reduces compensation costs by realizing economies-of-scale in the provision of compensatory mitigation.
- Banking provides greater predictability to qualifying permit applicants by reducing the cost and delays often associated with the permit review process.

1. Single-User Mitigation Banks: The ability of mitigation banking to improve the economic efficiency and environmental effectiveness of wetland regulation has been constrained by its limited use to date, however. A recent survey and analysis of mitigation banks conducted by IWR (1994), with the assistance of the Environmental Law Institute, found that of the 44 banks in operation as of Summer 1992, over 90 percent of these banks (40 of 44) were developed and used exclusively by a single public or private entity to provide for its own future mitigation needs. What has effectively been negotiated in this type of "single-user" bank is a reduction in permit review requirements for a single developer who has a sequence of highly certain wetlands development activities. Such banks are limited to those large public and private developers which routinely undertake many independent projects, and can afford the substantial up-front investment in compensatory mitigation. For example, approximately 70 percent of the operating banks identified in the Institute for Water Resources study were established by government or quasi-government agencies to compensate for the wetland impacts of their own public infrastructure projects.

2. Public Commercial Banks and Fee-Based Mitigation Systems: In an effort to extend the advantages of banking to a broader set of permit applicants, a few government and non-profit entities have subsidized the construction and operation of public "commercial" banks. These banks offer mitigation credits for sale to the general public, and the proceeds from sales are

used to recoup the costs of bank construction and management.

Similarly, a number of states and localities have established public fee-based mitigation systems, sometimes referred to as "in-lieu fee systems" or "mitigation trusts", for permitted projects involving small wetland impacts in which on-site mitigation projects would be infeasible or impractical (IWR, 1994). Public fee-based systems charge permit fees in lieu of the direct provision of mitigation by permittees. Revenues from fees are accumulated in trust funds for the intended *future* provision of replacement wetlands by the government entity.

While the broader establishment of these two public mitigation systems could extend the advantages of mitigation banking to a wider set of permit applicants, each is faced with potentially serious problems which must first be overcome. One major problem for establishing public commercial banks involves the substantial up-front financing needs for bank construction and management. For example, the Oregon state legislature authorized the creation of state wetlands banks, but the state has not yet been able to provide the needed funds for bank capitalization. Fee-based mitigation systems may also face financing problems since there is no guarantee that dedicating collected fees to trust funds will protect the receipts from other uses. Some states have "raided" trust funds established for other purposes. For example, in Maryland a portion of the land title transfer tax was to be dedicated to the purchase of development rights for farmland. However, over time some of those funds have been allocated to other purposes.

3. Mitigation Credit Markets: Private Commercial Banks: A parallel, but less active, interest of all levels of government involves a private market approach to mitigation credit trading. In 1991, then President Bush indicated his interest in encouraging a "market-based" mitigation program in which private entrepreneurs, who have

no wetland development of their own to compensate for, would create mitigation credits for sale to permit applicants in need of compensatory mitigation under the Section 404 program. Unlike commercial banking by public entities, a private credit market system would tap the profit motive to encourage private entrepreneurs to create mitigation credits with private capital. If a number of suppliers emerge to sell credits to many possible buyers, a market for wetland functions would develop. *Market competition could ensure that mitigation credits were provided at least cost, and provide incentives for the further development of wetlands restoration science and technology as restoration firms seek out more successful restoration techniques.*

Although the Bush Administration favored the idea of private markets in mitigation credits, little progress was made in developing the concept. Still, interest in the general theme of mitigation banking remains strong in the new administration and in Congress, and this interest may include private commercial banks. The Clinton Administration Wetland Plan released on August 24, 1993 expresses support for the use of mitigation banking in the Federal regulatory program. The plan states that:

"Congress should endorse the appropriate use of banking as a compensatory mitigation option under the Section 404 regulatory program, within environmentally sound limits. Congress should also explicitly allow use of the State Revolving Fund by States to capitalize mitigation banks" (White House Office of Environmental Policy, 1993).

It is unclear whether the Administration's recommendation for the use of Federal funds to capitalize state banks refers to the establishment of public commercial or single-user banks. If the former, this would suggest that the Administration supports the general concept of commercial banking, which could also include private sector bank ventures.

Further, two of the four most popular wetland reform bills introduced in Congress in 1993 support the use of mitigation banking in the Federal regulatory program. In the Senate, S. 1114, Title VII provides for the development of Federal rules for the establishment, use, maintenance and oversight of public and private mitigation banks. One House bill--H.R. 1330--would establish a mitigation banking program in every state to promote both public and private banks. Like the Administration Plan, these two bills do not explicitly endorse private commercial banking, but leave open the possibility. Another wetlands reform bill--H.R. 3465--that would establish a banking program does not mention commercial banking. A fourth wetlands reform bill in the House--H.R. 350--does not mention mitigation banking.

Certain states and localities have moved ahead of Federal law and policy by explicitly authorizing private mitigation credit markets. In Placer County, California, for example, the local government has developed extensive draft guidelines to encourage the operation of commercial mitigation banks, including specifying the conditions under which credits could be created and sold. By providing these guidelines the county hopes to encourage private investment in wetland restoration. The credits created would be sold to developers needing state permits for wetland impacts which fall outside 404 jurisdiction, but which are regulated under California law.

At the state level, the Maryland legislature in 1993 passed a mitigation banking law that expressly authorizes the establishment and use of private commercial banks in the state's regulatory program. The new law is intended to encourage the use of private credit markets to further the no-net-loss and net gains goals of the 1989 Maryland Nontidal Wetlands Protection Act. The law directs the state regulatory agency to issue regulations relating to all facets of the establishment and use of private commercial banks. In Florida, the State Department of

Environmental Regulation is drafting regulatory guidelines for private mitigation banking. As in Maryland, these guidelines are being issued in response to a legislative directive.

Although Federal law has yet to specifically authorize the establishment and use of private commercial mitigation banks in the Section 404 program, two private commercial banks--the Millhaven Plantation Bank in Georgia and the Florida Wetlandsbank--each received in 1993 Department of Army permits to create and sell mitigation credits under the 404 program. And more than a dozen other private commercial banking ventures are currently being planned, and at least one appears to be nearing regulatory approval. (The Fina Laterre bank in Louisiana was actually the first private bank to obtain regulatory permission to offer credits for commercial sale to the general public. However, this bank was originally developed as a single-user bank, and subsequent credit sales from the bank were the result of the owner making the best use of credits remaining after its own mitigation needs had already been met.)

Interviews conducted with Federal and state regulators who were (are) involved in reviewing and approving the newly-permitted and emerging private commercial banks indicate that they were willing to forge ahead with negotiation of these ventures in the absence of explicit Federal policy and guidance because of local needs for more readily available and ecologically successful alternatives to on-site mitigation, particularly for small wetland impacts. Regulators pointed specifically to the opportunity for using private banks to increase the chance of obtaining successful compensatory mitigation in cases involving small wetland impacts allowed under general permits.

Although private commercial banking is now a reality under the Section 404 program in two small areas of the country and will likely expand to other areas in the near future, the widespread emergence of private mitigation credit markets is

not assured. Wetland restorations created for credit sales require large-scale investments by entrepreneurs, and such investments will be made only if there is an expectation that profits from sales will yield a competitive return on investment. This profit potential in turn depends on regulatory policies which dictate the demand for permits and influence the cost of producing mitigation credits. *The very existence and structure of markets in wetland mitigation credits depend on regulatory policies.*

D. Meshing Development and Environmental Objectives

The operation of private credit markets to assure mitigation success requires bargaining among three agents: credit suppliers, permit applicants, and regulators. Each has its own objectives and constraints, and each approaches mitigation credit trading with its own expectations and strategies. To a large extent the opportunities and constraints faced by credit suppliers and permit applicants depend on regulatory goals and the trading rules established by regulators to achieve them. (Other agents, such as environmental interest groups, may have their own agenda regarding mitigation trading which they try to advance by influencing regulators). The ability of mitigation credit markets to meet the objectives of all three groups will determine whether or not they can operate to provide compensatory mitigation.

The objective of *permit applicants* is to maximize the rate of return on investments in wetland development projects. To the extent that permit applicants are required by regulators to provide mitigation, they will try to minimize the costs of this requirement so as to maximize development returns. The objective of *credit suppliers* is to maximize the rate of return on investments in wetland restoration. They will try to minimize their costs so as to maximize their own return on investment.

If a permit applicant buys credits from a supplier to meet a mitigation requirement, what the applicant is really purchasing is not mitigation, *per se*, but a development permit. That is, the willingness of permit applicants to pay for credits is established by the regulatory requirement for compensatory mitigation as a condition for receiving permits. Because of this, a normal market exchange between a permit applicant and a credit supplier cannot be expected to result in assured, long-term mitigation success. In the absence of any conditions imposed by regulators to minimize the risk of mitigation failure, there is no economic incentive in this exchange for permit applicants to strive for self-maintaining wetlands as a mitigation product. In fact, since the potential profits of permit applicants is inversely related to mitigation costs, there is an economic incentive to minimize mitigation costs and, therefore, mitigation quality.

The poor success rate observed for on-site mitigation efforts reflects in large part these poor incentives for successful wetland restorations (see: National Research Council, 1992). *The existing market for on-site mitigation illustrates that when regulators do not establish adequate design standards, enforce actual construction, or hold permit applicants (or mitigation suppliers) liable for mitigation project failure, permit applicants can and often will reduce restoration expenditures at the expense of long-term mitigation success.*

The objective of *regulators* is to protect the wetland functions in a watershed. The 404 regulatory program has administratively adopted a policy goal of achieving no-net-loss in wetland function, to be followed by net gain, to meet this objective. These goals are the result of legal mandates which govern the administration of the regulatory program.

Figure 1 illustrates the necessary conditions for mitigation credit markets to operate and serve the objectives of permit applicants, credit

suppliers, and regulators. The shaded, overlapping area represents a situation where the objectives of all groups are satisfied: credit suppliers and permit applicants each earn at least some profit, and the no-net-loss goal of regulators is achieved.

E. Demand and Supply for Credits: Basic Economic Factors

This section examines the effect of regional economic factors on the potential for private mitigation credit markets. For purposes of illustration, it abstracts from the regulatory policy environment so that the general economic forces affecting credit markets can be described.

Entrepreneurs would supply mitigation credits in any given region if they could expect to earn a competitive return on investments in wetlands restoration. Assume that regulators have made it clear that they will not subsidize credit suppliers in any way, but will allow credits to be sold after mitigation sites achieve some clearly specified criteria. Assume further that credit suppliers are confident that they can satisfy these criteria and can produce credits certified for sale immediately after completing mitigation construction at the project sites. Under these conditions, the present value cost of producing credits is the only factor that determines the willingness of mitigation suppliers to sell credits at different prices. Given fully competitive markets, the position and slope of the supply curve for credits would be determined by the costs of producing credits, including interest charges on invested capital until the credits are sold, and the risk costs from possible failure of mitigation sites before credits are certified for sale.

Demand for mitigation credits in most geographic regions exists among land developers, highway departments, and other organizations that must provide mitigation in order to satisfy permit conditions. These potential buyers of

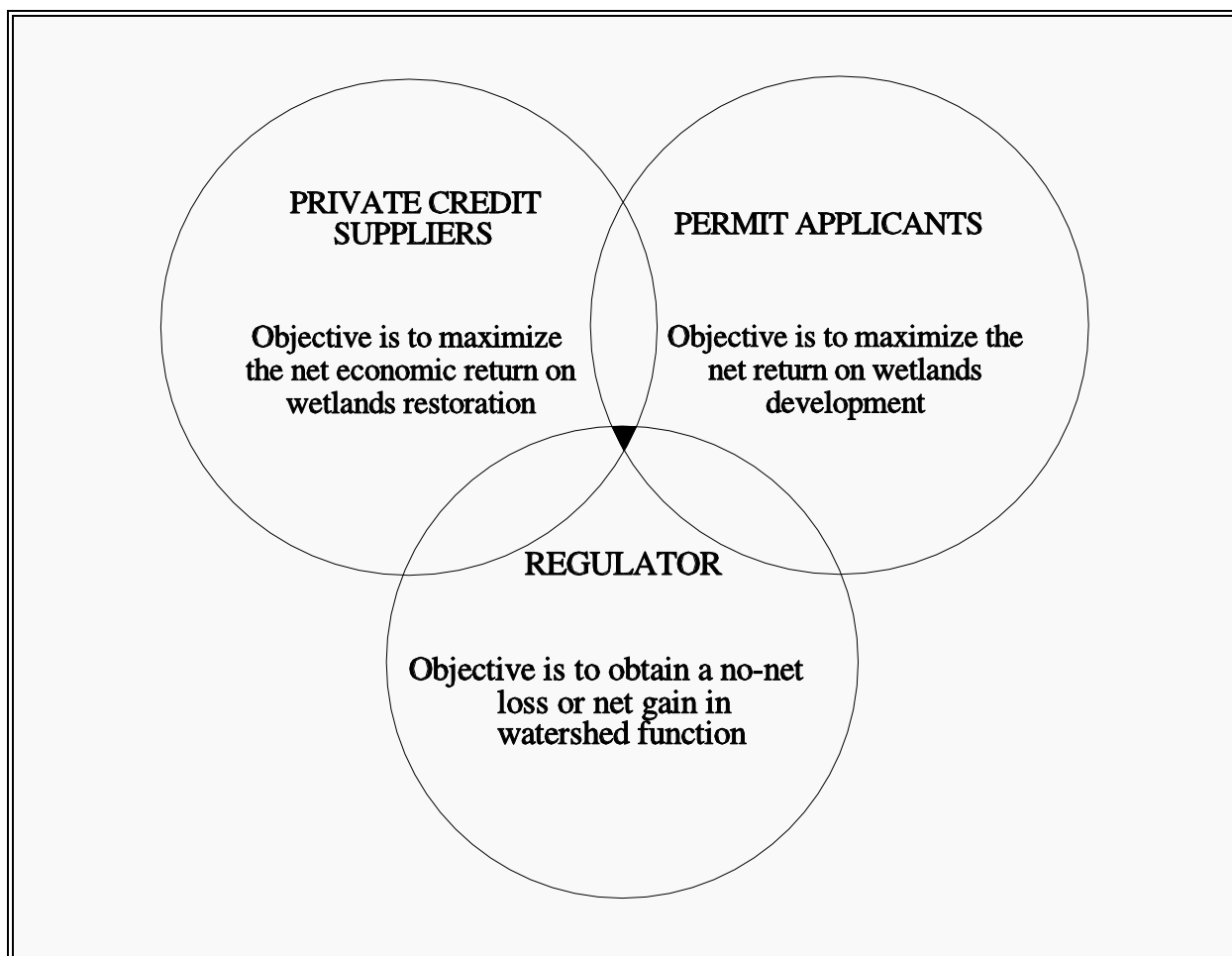


Figure 1. Linked Objectives of Regulators, Permit Applicants, and Credit Suppliers

mitigation credits will demand credits only if credit prices are less than the cost of on-site mitigation or self-initiated off-site mitigation and still offer a positive rate of return from receiving permits. These economic factors, across all permit applicants, establish the demand for mitigation credits at various prices--the position and slope of the demand curve for mitigation credits.

The position and slope of the supply and demand curves are determined by production costs and wetlands development pressure, respectively, in each geographic region. However, it is the interaction of supply and demand within each region that establishes credit prices and the number of credits needing to be supplied. Since the

economic forces establishing the supply and demand for mitigation credits vary across geographic regions, there is no reason to expect that credit markets will emerge everywhere, or that the amount of traded credits would be significant.

To illustrate some potential regional differences, compare the prairie potholes of North Dakota that can be restored relatively quickly and inexpensively, with the coastal emergent wetlands of Cape Cod, Massachusetts that are time-consuming and expensive to restore. On the basis of these supply-related factors alone, the potential for mitigation credit markets appear to be greater in North Dakota than in Cape Cod. However, there is much greater development pressure in

Cape Cod, and the tourism-based development pressure found there is profitable enough to justify much more spending on mitigation than the farm-related activities responsible for the draining of potholes in North Dakota. Based on demand-related factors alone, credit markets would appear to have more potential in Cape Cod.

Figure 2 illustrates how the interaction of supply and demand under various circumstances might influence the potential for market-based mitigation trading. Four cases are represented indicating different supply and demand relationships. Case A depicts a region where mitigation costs and the demand for mitigation credits are relatively low--the situation described above for North Dakota. Case B depicts a situation involving high mitigation costs and high demand for mitigation--the situation described above for Cape Cod salt marshes. Credit markets might emerge in either case since the supply and demand curves shown for both Cases A and B intersect. Of course, for entrepreneurs in case B, the financial risk of investing in mitigation for sale is high, making careful assessment of market condition and production cost extremely important.

The need for detailed economic analysis of supply- and demand-side issues is less in Cases C and D. Case C depicts a situation where the cost of mitigation is relatively low and the demand for mitigation is relatively high. This may be the situation in some parts of Maryland and Virginia, for example, where filled and degraded Chesapeake Bay wetlands are abundant and relatively easy to restore, and demand for land by real estate developers who can afford high quality mitigation is relatively high. It appears that credit markets would succeed under the supply and demand conditions depicted in Case C.

Case D illustrates the opposite situation where the cost of wetland restoration is relatively high and the demand for mitigation is so low that prospects for successful private credit markets appear poor. This situation might occur in rural parts of Louisiana, for example, where the

profitability of converting forested wetlands for commercial or residential development may be relatively low, and the cost of restoration is relatively high.

These examples illustrate how fundamental economic forces determine the potential supply of and demand for mitigation credits. However, held constant in each of the illustrated cases is a regulatory framework and set of trading rules which were not discussed. The structure of these policies could overwhelm regional market forces by causing credit supply and/or demand to shift in ways that would create or destroy the potential for private credit markets.

F. Understanding the Effects of Regulatory Policies on Private Credit Markets

As noted earlier, the supply and demand conditions in markets for mitigation credits are exceptional because of two roles that must be played by government. First, credit markets could not exist in the absence of government regulations which create the demand for wetland development permits and make the granting of permits conditional on compensatory mitigation. Second, with regard to requirements for compensatory mitigation, permit applicants are price-conscious but not quality-conscious; their only concern is whether mitigation satisfies permit conditions established by regulators. It is the regulator, not the buyer of mitigation, who must impose "quality control" on the market through trading rules establishing how and when credits can be created and sold (King, 1992).

Figure 3 illustrates the various ways in which regulatory policies influence the underlying forces of supply and demand in private credit markets. The left hand column identifies the factors underlying the supply of mitigation credits, and the right hand column identifies the factors underlying

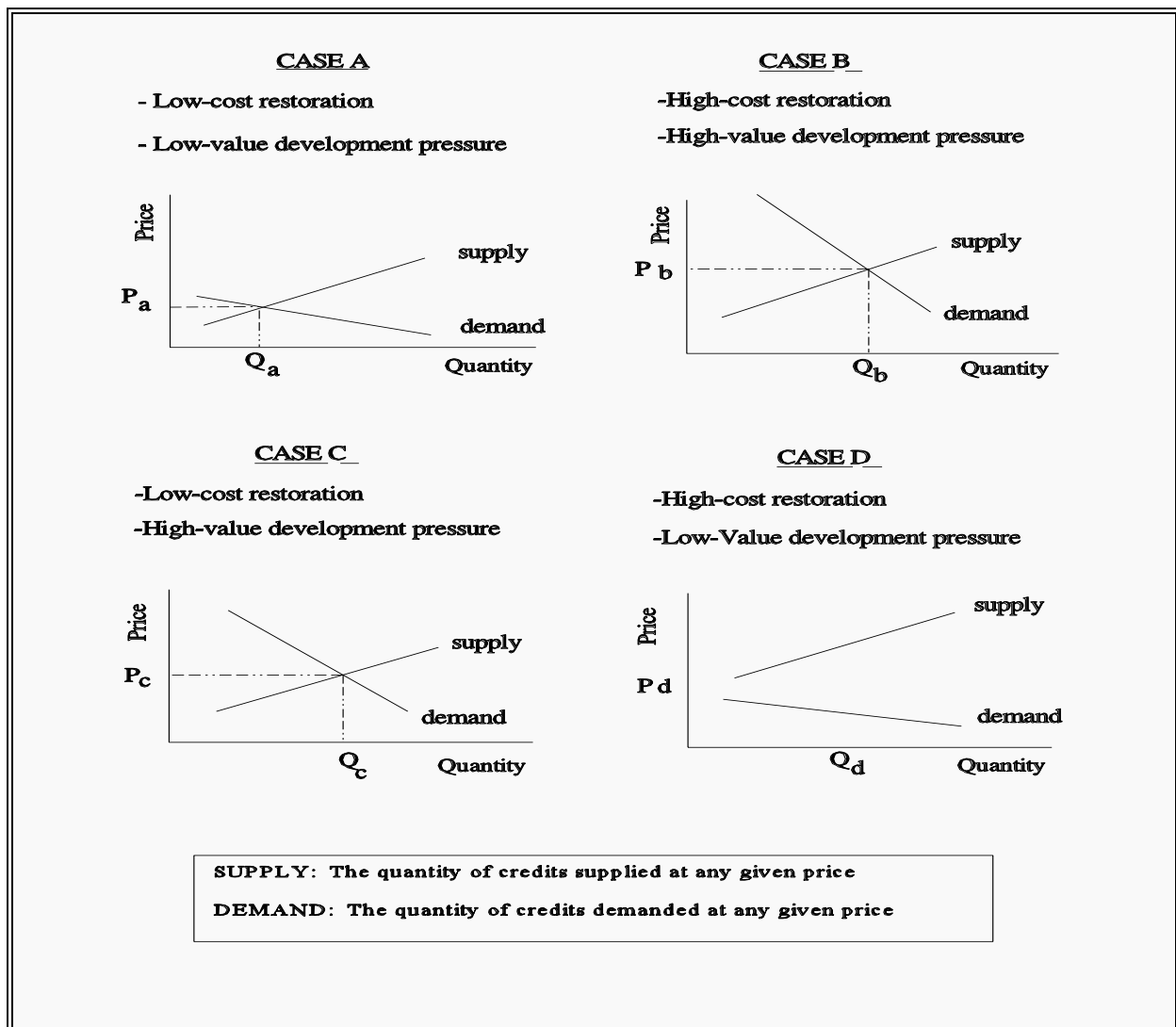


Figure 2. Regional Economic Effects on the Potential for Mitigation Credit Markets

the demand for credits. The supply of credits reflects the costs of acquiring (or leasing) and restoring former wetland areas to provide mitigation. The demand for credits is derived from the demand for permits and reflects the value of credits to permit applicants.

The center column of Figure 3 identifies policy decisions that influence the underlying forces affecting either the supply of or demand for credits. Lines connecting the policy column with the supply and demand columns indicate where regulatory policies have the most significant

impact. The policy column includes government decisions regarding regulatory rules and trading rules.

The **regulatory rules** include policy decisions regarding (i) entry into the credit supply business and (ii) watershed planning. The effects of regulatory policies on credit demand and supply will be explored in Section IV.

Regulator concerns with credit trading center around the risk of mitigation failure. To address these concerns in the establishment and use of

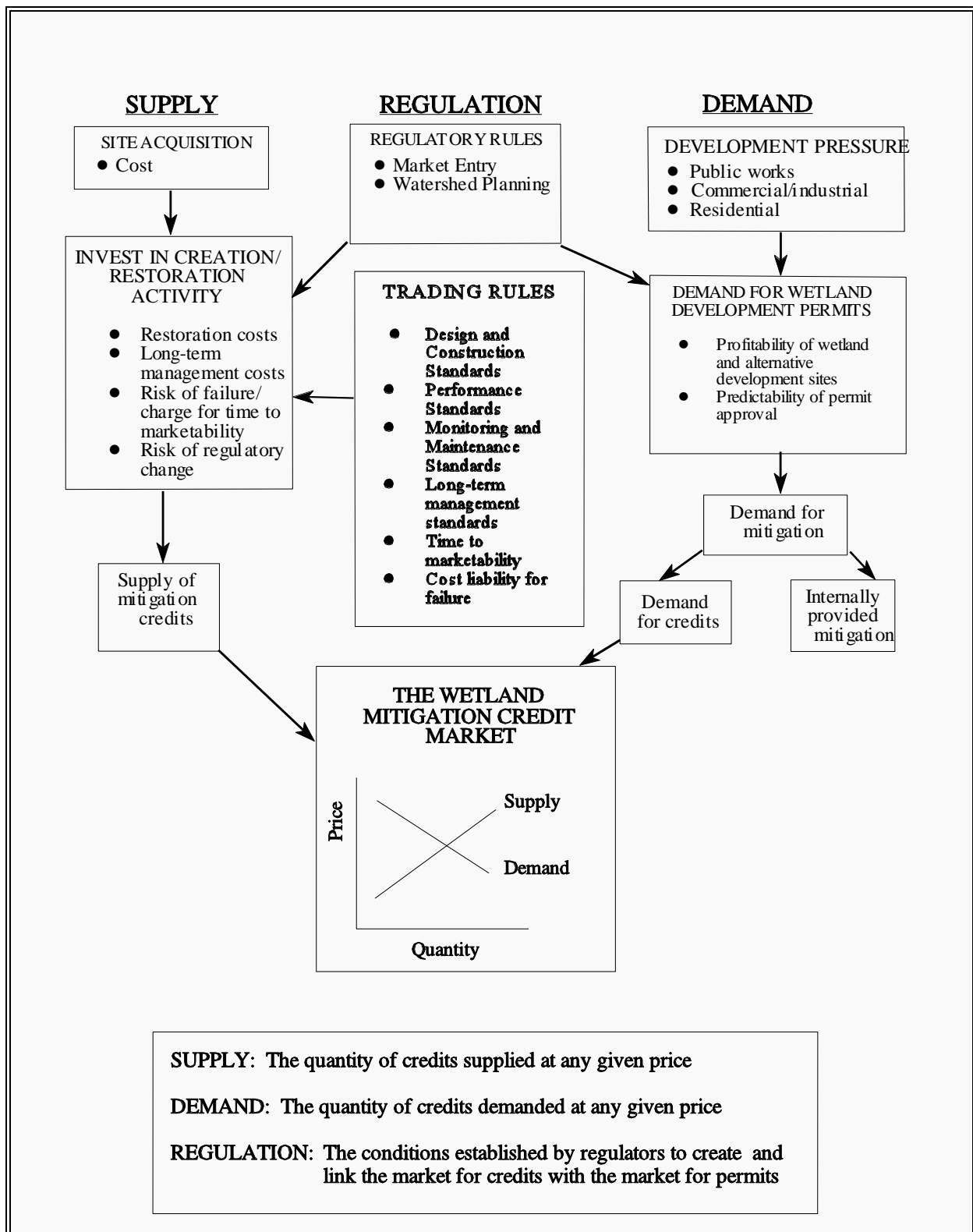


Figure 3. Regulatory Policies Influence Wetland Mitigation Credit Markets

private commercial banks, regulators can establish a set of interrelated **trading rules** to increase the probability of mitigation success, and thus the certainty with which policy goals can be met through credit market systems. Trading rules could include mitigation design and performance standards, monitoring and maintenance requirements, cost liability for project failure, and provisions for long-term site ownership and management. Also, the trading rules must include conditions for when credits could be marketed.

All these trading rules affect the cost of producing credits and thus credit prices, and trade-offs among them may be necessary to preserve the economic viability of credit market systems. In particular, prospective credit suppliers have a strong preference for selling credits at the time restoration sites are constructed or immediately

after completion. This would lower the costs and financial risks to suppliers by eliminating the need to tie-up large amounts of money for extended time without any cash flow from credit sales. If such early credit sales were allowed, however, then trading rules which establish quality standards and cost liability for failure would assume more importance. For example, if a prospective credit supplier had a restoration site and mitigation expertise viewed by the regulator as likely to produce a successful mitigation project, then the regulator might allow credit sales if certain design and construction standards were met. However, since at that point the bank mitigation would likely be an immature wetland and not yet even a self-sustaining system, the regulator might also want to impose on the credit supplier performance standards, monitoring and maintenance requirements, and cost liability for project failure.

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III. TRADING RULE REFORMS TO PROMOTE CREDIT MARKET SYSTEMS AND LIMIT AND ALLOCATE MITIGATION FAILURE RISK

Concerns about mitigation center around the potential for restoration failure. Refer to Figure 4, which shows the "restoration success" time-path for a mitigation site to appreciate the nature of this concern. The vertical axis of Figure 4 is an index of the functional value per acre at a mitigation site, and the horizontal axis measures time, where $t=n$ is the time at which the mitigation site is constructed, $t=n+1$ is the time at which the site reaches a self-maintaining state, and $t=n+2$ is the time at which the site achieves functional maturity. When the site reaches a self-maintaining state, full function and value have not (necessarily) been achieved, but the site has a high degree of persistence and resilience to natural and anthropogenic disturbances and does not require extensive management inputs to stay viable. The solid line shows the time-path representing how the level of

ecological functioning of a restoration site increases with time. The dashed lines represent hypothetical confidence bands around the time-path. The confidence bands narrow over time as restoration "success" becomes more certain. In terms of the regulator's concerns, the confidence bands show that the probability of restoration failure declines with time (King, Bohlen, and Adler, 1993).

Concerns over project failure, and who is liable for such failure, are heightened by the disappointing historical record of on-site mitigation efforts. However, many who are skeptical about wetland restoration in the mitigation context fail to distinguish between failures of the science and failures due to poor application of the science. The available evidence suggests that much of the

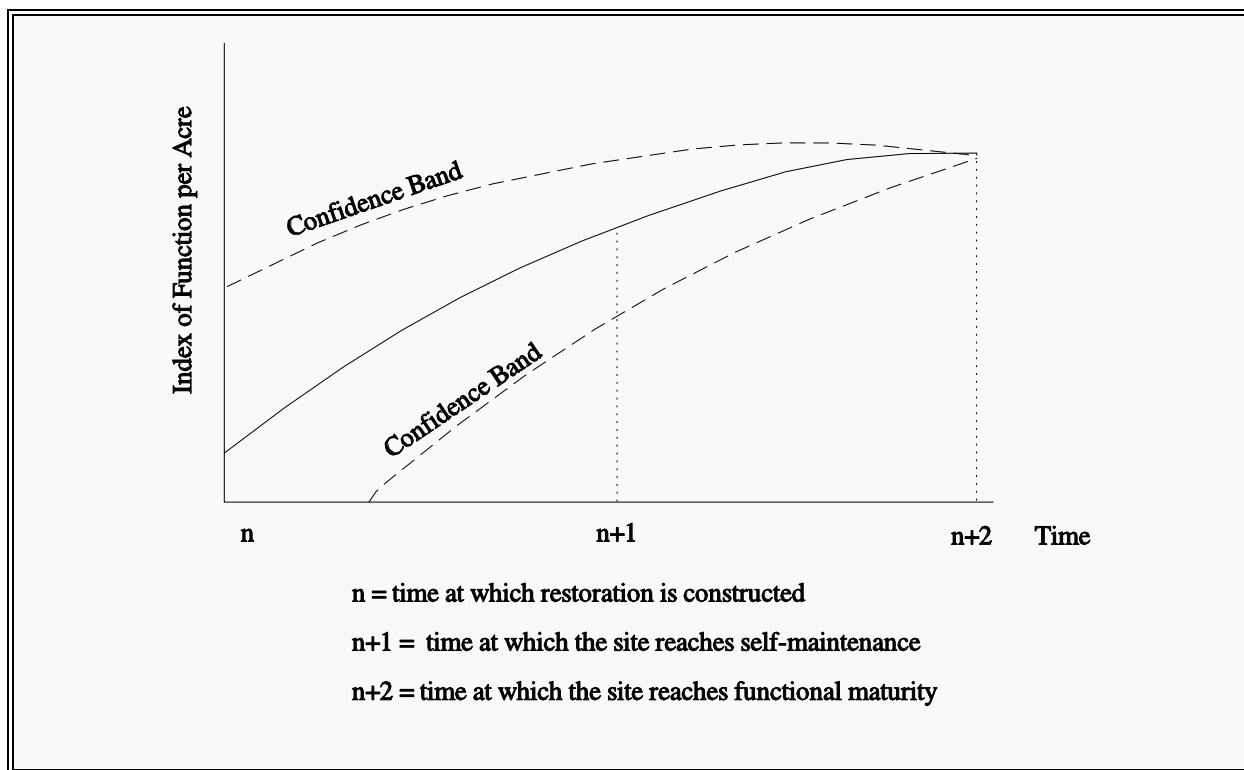


Figure 4. Change In Confidence In Restoration Success Over Time

observed failure of on-site mitigation is the result of vague restoration goals, inadequate expertise in performing restorations, failure to fully implement and enforce mitigation requirements, and an absence of site monitoring and management over time. This suggests that the institutional problems which lead to mitigation failure and net loss of wetlands should be addressed in setting up a market-based mitigation trading system, but should not be confused with the technical challenges of wetland restoration. *The challenge confronting regulatory agencies is to set rules for credit trading systems that limit the risk of mitigation failure and allocate liability for failure in a manner that is not cost-prohibitive, while at the same time ensure achievement of regulatory goals to maintain and improve wetland functions.* The types of trading rule reforms that could promote this result are the subject of this section.

A. Timing of Credit Marketability

The recently issued interim national guidelines for mitigation banking (U.S. Environmental Protection Agency and Department of the Army, 1993) state that replacement wetlands should generally be in place and functioning before credits can be used to offset permitted wetland impacts. This timing requirement stems from regulator concerns about mitigation project failure. At the same time, however, the timing issue is critical for the economic viability of private commercial banks. If regulators prohibit credit sales until fully functioning or self-maintaining wetlands have been achieved at mitigation sites, then credit suppliers would bear two costs: (1) costs of waiting for the maturation of replacement wetlands (i.e., the opportunity costs of invested capital); and (2) costs of self-insuring against the risk of unforeseen natural events that might disrupt the attainment of the criteria used to measure success (assuming they are stated by the regulators). Credit prices would need to rise to cover all these costs.

The interviews conducted for this study with existing and prospective credit suppliers strongly suggest that in most cases the cost of waiting and bearing strict liability for mitigation failure would be too high for them to earn a competitive return on investment. Given the potentially long waiting times to gain approval for credit sales, the interviewees were concerned that the price per credit they would have to charge to ensure a competitive, risk adjusted rate of return would be above that which permit applicants would be willing to pay. This would especially be true if on-site mitigation does not face the same requirements.

The interim banking guidelines seem to acknowledge this problem by allowing that:

"... it may be appropriate to allow incremental distribution of credits corresponding to the appropriate stage of successful establishment of wetland functions. Moreover, variable mitigation ratios (credit acreage to impacted wetland acreage) may be used in such circumstances to reflect the wetland functions attained at a bank site at a particular point in time. For example, higher ratios would be required when a bank is not yet fully functional at the time credits are to be withdrawn" (U.S. Environmental Protection Agency and Department of the Army, 1993).

These provisions provide one possible way in which regulators' concerns for mitigation project failure can be reconciled with the financial constraints of private credit suppliers.

This was essentially the approach used for the Millhaven Plantation bank. The bank's permit states that when mitigation activity is completed for a particular mitigation parcel according to Federally-approved specifications and a "preliminary determination of hydrology" is made, the bank will then be allowed to sell one-half of the total mitigation credits generated by that parcel. The bank must then show within three years that the parcel satisfies wetland delineation criteria relating to hydrology, soils, and vegetation

before the remaining credits generated by the parcel can be sold. Moreover, the Corps project manager for the bank has sole discretion to establish trading ratios for any particular use of the bank. In an interview, the project manager noted that the Corps will adjust trading ratios to account for the maturity of replacement wetlands relative to impacted wetlands.

However, even this added flexibility in the timing of credit sales may be insufficient to promote the widespread establishment of private commercial banks. Our interviews suggest that some entrepreneurs would not enter the credit supply business unless they were permitted to produce credits concurrently with the wetland impacts for which the credits will serve as compensatory mitigation. In fact, the Federal permit for the other operating private commercial bank, Florida Wetlandsbank, allows for such concurrent mitigation. In this case the banker successfully argued to regulators that the financial viability of the venture depended on using revenues from credit sales to finance the construction of replacement wetlands for those credits. The bank does intend to provide some advanced mitigation once sufficient revenues from credit sales based on concurrent mitigations have been accumulated.

Regulatory and resource agency field staff consented to the bank provision for concurrent mitigation based on their recognition of the substantial costs of restoring the site up-front, and the need for the bank to proceed with site restoration in a phased manner. In an interview, the Corps project manager for the Florida Wetlandsbank also indicated that the Corps was confident that the banker's favorable restoration site, plan, and mitigation expertise would result in a more successful, and more easily monitored and maintained, mitigation than what is typically provided by on-site mitigation projects.

These two permitted private commercial banks illustrate that *if market-based trading systems are to operate, there may need to be*

opportunities for credit suppliers to sell credits before full functional maturity or self-maintenance is reached at wetland restoration sites, and in some cases, perhaps even at the time in which mitigation is undertaken. However, such early credit sales will be allowed only if regulators' concerns about the risk of project failure and who bears the consequences of failure are accounted for. Trading rules to limit and allocate the risk of mitigation failure in the credit market context are explored below.

B. Performance, Monitoring and Maintenance, and Long-Term Management Standards

The consequence of mitigation failure could be that compensation for granting a permit will not be realized, or that the public will have to make an expenditure to repair the failed mitigation. In advance of the replacement wetland being in place and fully functional, the failure risk cost for a mitigation site is the product of:

- The probability that the restoration site will not achieve some long-term functional maturity; and
- The cost to repair or replace the restoration site when the compensation is not achieved or does not persist over time.

Mitigation failure can result from a number of factors, including poor project siting and design, inadequate or incomplete application of restoration science, and limitations in the current state of that science. In addition, mitigation failures can result from unpredictable natural events which take restoration projects off the path to maturity before the point of self-maintenance is reached.

The risk of mitigation failure due to unpredictable natural events requires additional

explanation. Natural disasters such as droughts and hurricanes may compromise the long-term viability of mitigation sites. Although disaster risks might be lessened somewhat through careful siting and restoration design, mitigation failures resulting from such extreme events are largely uncontrollable.

However, there is another class of natural events that regulators often feel can and should be controlled for by those establishing mitigation sites: the unexpected invasion of sites by unwanted plant or animal species. But if, for example, a mitigation site is colonized by beavers or muskrats which cause a somewhat different than planned plant community to evolve, this should not necessarily be considered mitigation failure. Willard and Klarquist (1992) explain the basis for this view:

"Often we attempt to recreate or preserve a specific wetland type with a particular species mix and precise geography. Now we accept that wetlands are living systems and some types do change. They grow, change species and become other systems. Yet we prescribe mitigation plans which dictate constancy and attempt to construct a particular kind of wetland in place forever. Recent work in fresh water systems (e.g., potholes, western riparian streams, mid-western floodplains and elsewhere) have awakened new interest and understanding of systems that must change to persist."

This observation raises two important points for private commercial banks. First, success criteria (i.e., performance standards) must be established to judge whether a mitigation bank is failing or has failed, and these should be defined in advance of credit sales. Second, performance standards should provide some leeway to account for less-than-extreme natural events that may cause a mitigation bank to evolve along a somewhat different path than originally planned.

The success criteria written into the permits for the Millhaven Plantation bank and the Florida Wetlandsbank appear to provide some flexibility

by focusing on biological diversity at mitigation sites. Millhaven Plantation is required to maintain 300 trees per acre, and at least 25 percent of the "dominant" trees must be hardwoods. Further, no single species of planted or naturally occurring tree can at any time represent more than 30 percent of the dominant trees. Similarly, the success criteria for Florida Wetlandsbank require 85 percent survivorship of planted vegetation at 2 and 5 years after a mitigation parcel is certified for credit sales. Florida Wetlandsbank's permit goes on to say that "No more than 10 percent of the planted area may support exotic or undesirable plant species; it is noted that 10 percent of exotic or undesirable plant species may contribute to habitat diversity."

Each of these two permitted commercial banks are held to their respective performance standards during the course of 5-year monitoring and maintenance periods established for each mitigation parcel certified for credit sales. Each bank is required to perform site monitoring and submit monitoring data to regulators as well as remedial plans for any discovered deficiency. In the case of Millhaven Plantation, if a deficiency is uncovered, a new 5-year monitoring and maintenance period begins at the completion of remedial work undertaken to correct the deficiency. Both banks are released from further responsibility for any mitigation parcel in which the 5-year monitoring and maintenance period is successfully completed.

As the permits for these two banks implicitly acknowledge, it would be unreasonable to hold credit suppliers to performance standards for more than some limited period of time. But at the successful conclusion of performance periods, concern may still remain about possible project failure arising from a lack of long-term wetland status at the mitigation site. Here the concern is that after all credits are sold and performance periods are successfully completed, there will be no interest in keeping the mitigation site as a wetland area. This concern has two elements. One is that the site will require long-term

management to keep it a wetland. The second is that the owners of the site will seek to put it to a non-wetlands use at some future date.

The contract provisions that authorize mitigation suppliers to create and sell credits could address these potential problems. For example, contracts might require that restoration projects be designed to be self-maintaining and/or there may be a requirement for some form of endowment with the earnings dedicated to perpetual maintenance. The endowment might be put in the hands of a management agency or a conservation group which would have similar maintenance responsibilities as a Parks Department. The ability to sell the site for a non-wetlands use might be restricted by requiring either a plan to transfer the site to public ownership and/or a conservation management entity, through permanent easements and deed restrictions.

The permits for Millhaven Plantation and Florida Wetlandsbank include such provisions. The land on which the Millhaven Planation bank is located is owned by a private, second party who leases the site to the banker. The permit for the bank is conditional on a perpetual conservation easement with the Corps which requires the landowner to observe certain management standards designed to ensure the future status of the mitigation site as a wetland area. The Florida Wetlandsbank also leases the bank site from a separate landowner--the city of Pembroke Pines. Mitigation areas for this bank are protected by conservation easements into perpetuity, which also require the city to perform perpetual site management. Payments of \$1,000 per mitigation acre were provided by the banker, based on estimates of maintenance cost jointly agreed to by the banker and regulator.

The above discussion suggests that regulators must clarify the "contract" conditions for credit suppliers in Memoranda of Agreement (MOA) and/or bank permits. *The agreements recorded in these contracts must specify (in addition to mitigation siting, design and construction plans):*

performance standards that define the conditions under which mitigation projects would be judged successful; monitoring and maintenance requirements to uncover and correct deficiencies, and; provisions for long-term site management. Moreover, performance standards should provide some leeway to account for less-than-extreme natural events which might cause mitigation sites to evolve along somewhat different paths than originally planned.

C. Liability Rules for Private Credit Markets

The risk of mitigation project failure is not a concern to permit applicants (i.e., credit demanders) once permits are granted, unless they are held liable for any costs necessary to repair a failed restoration. And while many credit suppliers would likely take pains to ensure that their restoration sites are successful in order to further their future prospects in the credit supply business, failure risk may be a concern to more opportunistic credit suppliers only if restoration projects fail before all credits are sold or if they bear cost liability for mitigation project failure. This suggests that to ensure quality control at mitigation banks, regulators should impose cost liability on credit suppliers for failure to meet site design, performance, and management standards.

However, cost liability should not be imposed for mitigation failures resulting from natural disasters or other extreme events which prevent the attainment of performance standards for completed mitigation parcels. If credit suppliers were held liable for mitigation failures resulting from extreme events beyond their control, this could raise the risk costs borne by credit suppliers to the point where credit market systems could not operate. *In order to ensure mitigation quality control while maintaining the economic viability of private credit markets, regulators should allocate to credit suppliers (or demanders) those failure risk costs resulting from non-performance with contract requirements regarding the design,*

performance, and management of mitigation projects, but not those failure costs resulting from extreme events which prevent credit suppliers from fulfilling contract obligations.

This issue was explicitly recognized and accounted for in the case of the Florida Wetlandsbank. The bank's permit specifies that if "acts of war, acts of God, rebellion, strikes or natural disaster, including hurricane, flood or fire" prevent the attainment of bank performance standards, the banker will not be held liable for such mitigation failure. However, the permit also says that if such extreme events "do not preclude the bank from performing permit conditions, the bank shall not be relieved of its obligations under the permit". While the permit for Millhaven Plantation has no similar provision, in an interview the Corps project manager indicated that the bank would not be required to replant vegetation destroyed in any completed mitigation phase as a result of extreme natural events such as hurricane damage, but the bank would be required to fix any damaged water control structure.

It is also crucial for the economic viability (and environmental effectiveness) of credit market systems that the amount of cost liability for failure risk imposed in any particular case reflect realistic failure probabilities and repair costs for that case. If this is done the private entrepreneurs' profit motive will encourage them to use current restoration technologies carefully and encourage them to develop new technologies in order to reduce the cost liability burden. Factors to be considered in estimating failure probability and repair cost for any particular mitigation site should include:

- 1) The stringency of requirements established by regulators for restoration design, performance, and management at the mitigation site. The more stringent the requirements, the lower the failure probability and the less the cost to repair a failed site.
- 2) The qualifications of, and regulators' historical experience with, the restoration contractor at the mitigation site. The more skilled and experienced the restoration contractor, the lower the failure probability.
- 3) The point in the time-path from initial restoration construction to functional maturity at which the credit sale is made. As time passes the certainty of successful restoration increases and costs to repair a failure falls.
- 4) The location of the restoration site within the larger watershed system. Placement of the site in the watershed where hydrology and potential biological integration is greatest suggests a higher probability of success.
- 5) The particular wetland type being restored at the mitigation site and historical restoration success rates associated with this wetland type. These factors can be used to judge likely restoration success.
- 6) The security of the long term status of the site as a wetland. Easements and trust funds for perpetual management increase probability of success over the long-term.

There are at least four options available to regulators for allocating cost liability for controllable failure risks. Such liability mechanisms, which are described below, should be included in the contracts that regulators write for each bank. The regulator should choose among the options (not use all of them) in recognition of the expected failure probability at the site. Further, as is illustrated below in the examples provided by the two permitted private commercial banks, liability mechanisms must be adjusted to the estimated failure probabilities and expected repair costs for each situation.

1. Higher Trading Ratio: The regulatory agency may adjust the trading ratio for credits from the bank parcel to address controllable failure risks (there are other reasons for adjusting ratios--see Appendix I). The trading ratio required for any particular sale to a permit applicant would be based on some computation of the likelihood of restoration project failure. For example, assuming that the regulator seeks to achieve a no-net-loss goal, a trading ratio for failure risk from purchases at one site might be 2:1. All other factors equal, that ratio would imply a failure probability of 50% at the credit supplier's site, and also that such failure would be complete (i.e., no functional value increase would occur at the site). Different trading ratios may be required for different mitigation sites or parcels to account for different failure probabilities across sites or parcels. In a competitive market, private credit suppliers would want regulators to impose lower trading ratios for any particular trade, and to this end would seek to reduce failure risk. And the lower the trading ratio required, other factors equal, the lower the compensation cost that would be paid by the permit applicant.

This option imposes risk costs on credit purchasers (i.e., permit applicants), but once the trading ratio is set and the credits are purchased, the public sector would be accepting the risk cost of restoration failure. Higher trading ratios would raise the costs to permit applicants of securing permits, and may dampen the demand for permits, and then for credits, to the point where the credit market would not operate. Therefore, the ratios must be based on realistic failure probabilities and repair costs (see the six items listed above).

2. Performance Bonds: The regulatory agency may alternatively require credit suppliers to post performance bonds as a way to provide financial assurance. With this option, the bond requirement would be set by and paid to the regulatory agency, and the payment would be reimbursed with interest if at some future date the regulator certifies that the credit supplier's mitigation was successful.

Partial refunds would be available for partial restoration success at the credit supplier's site. In fact, there may be some way to justify partial refunds each year. Early credit sales from the site would be permitted, and if the site fails the money in the bond would be used by the regulator to repair the mitigation project. The amount of the bond for any particular case would reflect the regulator's best estimate of the cost to repair the mitigation site if it fails; failure probability is not the concern of the regulator in setting the bond amount.

This approach places the failure risk cost on the credit supplier who would be expected to pass this cost on to customers. The total risk cost borne by a credit supplier is the sum of two costs. One cost is the difference between the market interest rate the supplier pays on the bond amount and the amount of interest (if any) paid by the regulator holding the bond. If the two interest rates are equal this cost is zero. The second cost is measured by the credit supplier's expected probability of non-reimbursement times the amount of the bond. For the credit supplier, the expected probability of non-reimbursement should be possible to assess if the contract with the regulatory agency clearly specifies the conditions under which site failure would be established. *Well-specified criteria for defining mitigation failure would increase the credit supplier's ability to estimate and take actions to minimize failure probability.*

Performance bonding is the financial assurance approach used in both the Millhaven Plantation bank and the Florida Wetlandsbank. The permit for Millhaven Plantation requires that the bank post a \$5,000 bond with the Corps for each acre of mitigation for which a "preliminary determination of hydrology" is made. Once the Corps makes a final determination that these acres have been restored to their "pre-drained hydrology", the bond amounts will then be reduced to \$1,000, and a 5-year monitoring and maintenance period begins. The bond balance will

then be released to the banker upon completion of the monitoring and maintenance period only if no negative reports regarding the restored acres are filed by the relevant state and Federal agencies. In the event of a negative report, the 5-year monitoring period begins anew and the \$1,000 bond is retained until satisfactory completion. The determination of the required bond dollar amounts in each phase were based on the regulator's estimate of repair cost for the level of failure expected to occur in each phase. The regulator expected that in the initial phase any mitigation failure would be less than 100 percent, and would be much lower in the second phase.

The permit for the Florida Wetlandsbank requires that the bank post performance bonds in the amount of \$8,800 per acre with the city of Pembroke Pines (the land owner) prior to the commencement of mitigation work. All but \$968 of the bond amounts will then be released in phases as certain milestones are reached concerning the eradication of exotic vegetation, site construction and planting, and the commencement of a 5-year monitoring and maintenance period. The balance of the bond amount in each phase reflects the regulator's best estimate of the costs to repair a failure occurring in each phase. This estimate was developed, in part, from cost information provided by the banker.

3. Collateral Banks: The performance bond approach collects funds and only after the mitigation has not met performance standards and the banker has failed to satisfactorily correct the deficiency would the regulator move to repair the mitigation. Another option available to address controllable failure risk would be to establish a functioning wetland restoration site to serve as a "collateral bank" to secure advanced compensation. The collateral bank could be developed at public expense or might be operated under a contractual agreement between the regulator and a private party. Credit suppliers, as they sold credits from their own mitigation site, would be expected to "lease" equivalent credits

from the publicly run or certified collateral bank. The amount of collateral credits that credit suppliers would be required to lease from the collateral bank would be based on the regulatory agency's estimate of the costs to create the collateral bank credits and the failure probability for the credit supplier's mitigation site. The cost to lease mitigation credits from the collateral bank should reflect credit production costs and interest charges on invested capital, including allowance for a competitive return on that capital, and would be set as follows. The cost for a credit at the collateral bank would be established and weighted by the regulator's estimate of the probability of failure at the credit supplier's mitigation site. Thus, if production costs at the collateral bank were \$30,000 per credit (including interest charges) and failure probability at the private site was expected to be 50% (and this failure would be complete), a lease price of \$15,000 would be charged.

As with the performance bond option, once the credit supplier's mitigation site was certified as successful, the lease payment would be refunded with interest. In this case, the amount refunded would be reduced by the allowance for a necessary profit if the collateral bank is privately developed. As with the performance bond, the credit supplier should be able to assess and reduce failure probability if the criteria for success are well defined by the regulatory agency.

If the credit supplier's mitigation site were judged a failure, on the other hand, then all the supplier's deposits to the collateral bank would be kept and the collateral bank would have less credits to lease. As failures occurred, the forfeited deposits would be used to create new collateral bank mitigations. In the case of failure, the required mitigation compensation would come from the collateral bank and not from the repair of the failed bank site.

4. **Insurance:** The regulatory agency may alternatively choose to charge an insurance premium against controllable failure risks as a condition for selling or purchasing credits. This would be a one-time and non-refundable payment made by the credit supplier or permit applicant for each credit traded. The premiums would be collected by the regulator, placed in a fund, and used to repair or even fully replace failed mitigation sites. This option shifts failure risk costs to credit suppliers and/or permit applicants, but once the insurance payments are made, the public sector would be accepting the responsibility to assure that wetland restorations or mitigation repairs were made to offset project failures. The premium would be based on an actuarial analysis of the probability and cost of project failure.

Such an insurance premium is required by the draft guidelines developed by Placer County in California for the establishment and use of commercial mitigation banks to provide compensation for wetland impacts which fall outside Federal regulatory jurisdiction. The guidelines stipulate that credit purchasers must pay an additional 25 percent of credit costs to the county which shall be held in a reserve account in order to provide for any remedial measures that might be necessary at commercial banks, or to provide replacement wetlands at some other location. The 25 percent figure represents the county's assumptions regarding expected failure probability and repair cost taking into consideration the other bank requirements imposed by the guidelines. However, the 25 percent figure must be considered somewhat arbitrary since it is necessarily divorced from the specific circumstances of failure probability and repair cost at particular bank parcels.

The above discussion illustrates the potential range of mechanisms that could be included in the contracts for private commercial banks (or wetland development permits) to allocate the risk costs of mitigation failure resulting from non-performance with contract requirements. *These liability rules should be viewed as substitutes for each other,*

and their use could vary by situation. Moreover, the level of risk cost established for any particular bank must reflect realistic failure probability and repair cost for that bank.

The need to adjust liability rules according to the previously listed six factors which bear on failure probability and repair cost underscores the argument that the potential of private credit market systems requires balancing the set of trading rules imposed on any particular bank. In the extreme, the specific trading rules and bank circumstances underlying the six factors, particularly that for the timing of credit marketability, might be so stringent and favorable for mitigation success that financial assurance becomes unnecessary.

This trade-off is illustrated by the permit for the Florida Wetlandsbank as well as the draft MOA for a proposed private commercial bank in Virginia that appears to be nearing final regulatory approval. While the Florida Wetlandsbank is permitted to sell credits concurrently with the construction of mitigation parcels for those credits, the bank also intends to provide some advanced mitigation (i.e., in place and functioning). The bank's permit specifies that the performance bond requirement for concurrent mitigations is waived in the case of mitigation parcels constructed in advance of credit sales. Similarly, the draft MOA for the proposed Neabsco Wetland Bank in Prince William County, Virginia says that "credits cannot be withdrawn prior to the Corps determination that the mitigation bank is a functional wetland", but includes no provision for performance bonding or other financial assurance.

D. Credit Valuation and Trading

The establishment of private commercial credit market systems requires that the type and level of wetlands functions and ecological values at the bank site be specified. Only if such a

functional assessment is conducted will it be possible to judge how many credits have been created for sale. Bank specific rules should be established for determining how credits will be defined and their level assessed.

The credit valuation protocol developed for any bank should relate to the needs and goals of the applicable watershed (as determined by resource managers and regulators), and the specific ways in which the bank intends to contribute to their achievement. Since watershed goals vary from area to area, and the specific ecological goals of banks vary from bank to bank, one would expect each commercial bank to have its own, somewhat unique, credit valuation protocol tailored to the wetland functional values of interest in the watershed. The fact that functional assessments vary greatly across banks can be attributed to variable bank conditions and goals as well as the lack of a standard, comprehensive wetland assessment technique that is applicable to all wetland types and landscape settings. (See Section IIB for an extended discussion of wetland assessment and Appendix I for detailed discussion of credit valuation and trading).

There are several broad approaches available for evaluating and expressing the ecological worth of bank replacement wetlands, and functional losses at permitted sites, in measures of mitigation credits. These include: (1) "simple indices" which rely on observable characteristics such as wetland type and area; (2) "habitat indices" which use measurements of specific wetland functions relating to wildlife support; and (3) "comprehensive functional indices" which define and base credit evaluations on quantitative assessments of a range of possible wetland functions. There are as many different ways in which such methods could be used as there are different banks. The Federally-permitted private commercial banks provide two concrete examples.

The permit for the Millhaven Plantation bank gives the Corps project manager authority to make final determinations of the number of credits generated by restored bank parcels after the relevant resource agencies have had the opportunity to review and comment on the quality of the restoration work, and to assess the relative functional values of permitted wetland impacts. In making this determination, "the Corps may use any available technology, resource or information it determines appropriate in performing these assessments and making wetlands functions and values determinations."

Further, the Corps project manager has sole authority to determine appropriate trading ratios on a trade-by-trade basis. In an interview, the Corps project manager indicated that "best professional judgement" will be used to make this determination. This will consider factors such as the particular types of impacted and replacement wetlands (out-of-kind trades are acceptable), their relative maturity, and the nature and level of their ecological functioning.

The permit for the Florida Wetlandsbank (FWB) specifies a much different approach for credit definition and evaluation. Credits are defined in terms of "integrated functional units" based on a functional assessment methodology developed by the Corps and EPA for everglade-type wetlands. This method evaluates wetland pollution assimilation, habitat, and flood control functions and translates these assessments into a single "integrated functional index" (IFI) value. The permit specifies that the FWB mitigations will result in a specific IFI value which "takes into consideration that the proposed bank represents and will function as a stand-alone system which will provide water quality, habitat and flood flow attenuation functions". To determine the amount of replacement wetlands required for any particular trade, an IFI value will be assessed for the impacted wetland and then translated into "FWB equivalent mitigation acreage".

In addition, bank-specific rules are needed to define the types and sizes of wetland development impacts for which the bank's credits can be used to provide compensatory mitigation, as well as the

bank's geographic service area. *These rules, as well as rules for valuing credits and determining trading ratios, must be written into the contract requirements for each bank.*

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IV. REGULATORY RULE REFORMS TO FACILITATE PRIVATE CREDIT MARKETS

In Section II a distinction was drawn between trading rules and regulatory rules. Both types of rules influence permit applicants' demand (willingness to pay) for credits and private commercial bankers' supply of credits (willingness to make investments in credit creation). Section III, which provided a discussion of trading rules, emphasized how rules for the timing of credit sales, standards of performance, and liability for project failure will influence entrepreneurs' willingness to invest in supplying credits. However, for the full potential of the credit market to be realized, the demand for credits must be assured, and the prices received for credits must be adequate to earn a competitive return on the investment in credit creation. Regulatory rule reforms to promote these results should 1) facilitate market entry opportunities for private commercial banks and 2) integrate mitigation banking into watershed planning and management.

A. Facilitating Market Entry

The benefits of private credit market systems would be enhanced if a sufficient number of private credit supply firms enter the market, making the supply of credits adequate for mitigation needs. Also, if there were many firms, competitive pressures would encourage firms to continuously seek ways to lower costs. Of course, the general market conditions must be favorable for market entry to occur (See Section II). For example, private banking would not be profitable in locations where there is little demand for wetland development permits. However, even where there is a strong potential demand for credits, regulatory rules must encourage market entry by avoiding actions which inadvertently reduce the demand for credits. There are four areas for attention.

1. Consistency in Mitigation Requirements:

The demand for credits supplied by private commercial banks will be reduced if the regulatory process does not hold on-site mitigations to comparable standards as those applied to bank mitigation projects. For example, in the past some single-user banks have not been allowed to withdraw credits until the bank mitigations were in place and certified as fully successful. Only then would wetland development permits be issued in return for compensatory mitigation from the bank. This requirement discourages banking of any type and encourages permit applicants to propose on-site mitigation, which is not held to advance mitigation requirements. At the same time, the implementation and enforcement of quality standards for on-site mitigation has been lax. Indeed, it has been the failure of on-site mitigation which has promoted interest in banking.

If this inconsistency in requirements for on-site mitigation and banking continues, then some permit applicants will be encouraged to choose the apparently "cheaper" alternative of on-site mitigation (despite the likelihood of failure) and seriously dampen the demand for private bank credits. Consequently, there needs to be across-the-board regulatory reform to assure that quality control standards are the same whether the mitigation is on-site or through a bank. In almost every interview conducted for this study the private bankers said that the possibility they will be held to higher standards than those who mitigate on-site was their greatest concern about financial success. The entrepreneurs behind the Millhaven bank suggested that this was a primary concern about their potential for financial success.

2. Competition from Public Banks:

The emergence of private credit markets may come

slowly, although interviews conducted for this study have revealed significant entrepreneurial interest and activity. In the interim, regulators may develop a banking system that brings public commercial banks into the supply side of a mitigation credit market. There are a number of potential barriers to bringing the public sector into the mitigation supply business however. One major problem noted earlier involves the lack of public funds for financing the construction of public commercial banks. This problem may also plague fee-based mitigation systems that collect fees in advance of the provision of mitigation, since there is no guarantee that dedicated fee revenues will actually be used for this purpose. Still, there are dozens of operating and proposed public commercial banks and fee-based mitigation systems.

Under a public credit supply system, the regulatory agency is responsible for producing wetland mitigation credits and recovers production costs through the sale of credits. However, unless public banks set credit prices (or in-lieu fees) at levels that recover all mitigation costs, including interest charges on invested capital and failure risk costs, they will have a competitive price advantage over private commercial banks. (Procedures for estimating public commercial bank costs are the subject of a forthcoming report.) If the price-setting process for public banks does not reflect all bank costs, then public banks will not only directly subsidize the mitigation of permit applicants, but also will introduce "below-cost" competition for private banks. This would cause the same problem for private banks as that produced by competition from lax regulatory standards for on-site mitigation. This does not mean that public banks should set prices as high as private banks in all cases, however. Due to particular circumstances, a public bank may realize some scale economies or lower failure risk costs. If this were the case then such efficiencies would justify a lower public price than private price.

Also, many of the interviewees for this study questioned whether public entities could adequately assess the financial risks of public bank ventures. The Bracut marsh public commercial bank developed by the California Coastal Conservancy illustrates this problem. Although operational, the bank has failed to be self-supporting, and the Conservancy forecasts that when all bank credits have been sold at proscribed credit prices the bank will have recovered only 54% of total costs (see: Environmental Law Institute, 1993).

3. Regulation of Private Credit Prices: Compensatory mitigation requirements (and other mitigation sequencing rules) put a "mitigation price" on receiving a wetland development permit. In the same manner, private markets in mitigation credits would put prices on permits. Once the trading ratio was set for a particular trade, the permit applicant would seek credits on the open market. The price per credit in that market, times the number of credits required to satisfy mitigation requirements, would establish the price for the permit.

Consider the following hypothetical situation. A private credit supplier can produce each credit for \$5,000. At the same time, a permit applicant who stands to make a profit by developing a particular wetland site is willing and able to pay as much as \$50,000 for the compensatory mitigation that will satisfy the permit conditions. During the regulatory review process the regulator considers failure risk and determines that the permit will be granted if the applicant provides three units of mitigation (i.e., credits) for the one unit of wetland function lost due to the development project (or 3:1 trading ratio). Knowing this ratio the permit applicant begins a negotiation with the credit supplier.

One possible outcome is that the permit applicant will only pay the credit supplier a competitive return price of \$5,000 per credit, incurring a total cost of \$15,000 for the permit. A \$35,000 development surplus would then remain

with the permit applicant. Another possibility is that the supplier is the only one in the area certified by the regulator, and is able to extract the full \$50,000 of the permit applicant's willingness to pay. In this case the \$35,000 development surplus has been transferred from the permit applicant to the credit supplier. In either case the secured replacement in wetland function is unaffected--the ratio is 3:1.

There is a third possibility. Suppose that before setting the trading ratio the regulator knew the permit applicant's willingness to pay (\$50,000) and the credit supplier's minimum price for selling each credit (\$5,000). In this case the trading ratio could be set at 10:1 and a deal between the applicant and credit supplier might still be made. In this case, the \$35,000 of development surplus would be transferred to the wetland resource or, more generally, to the public.

One perspective on these different distributional outcomes might be that the permit applicant has a property right to the site and its value. If the public is satisfied with the 3:1 compensation level, and if the credit supplier earns a return sufficient to keep resources in the mitigation supply business, then the \$35,000 should stay with the applicant. Such a view might call for price controls of some sort on the market if there is little price competition among suppliers. In fact, during the interviews some regulators at the field level expressed the concern that private entrepreneurs might make "too large" a profit from selling wetlands credits; that is, prices would be "too high." While they did not advocate price controls, they instead saw this as a reason to discourage private markets in mitigation credits. These people seemed to favor public banks in part for this reason. However, this viewpoint was not held uniformly by all regulators.

Another perspective is that the only reason for the 3:1 trading ratio is that the public did not realize how much the permit applicant was willing to pay for the permit. If this willingness to pay

were known by the regulator, then the net gain goal could be advanced by insisting on as much as a 10:1 trading ratio. Interestingly, during the interviews some regulators described how the determination of "acceptable" compensation for a permit often was partly established by the regulator's assessment of the applicant's willingness and ability to pay for compensation. However, offices of Federal and state agencies indicated that the regulator's job was only to secure acceptable mitigation compensation (i.e., secure replacement of expected lost wetland functions) for granting the permit, and that the financial capability of the applicant should not be a consideration.

It may appear that one way to stimulate market entry would be for the regulator to seek a very high (e.g., 10:1) trading ratio, presumably to stimulate credit demand. However, the nature of the feedback links between the markets for permits and credits complicates reaching such a straightforward conclusion. The trading ratio and the trading rules which affect credit price together determine the price of permits. Thus, higher trading ratios would increase the "mitigation price" for a permit, blunting permit demand and then credit demand. The net effect of these countervailing forces on private banks' credit demand as trading ratios are increased would depend on general market conditions which influence the demand for permits to develop wetlands.

The distribution of returns which best serves the interests of advancing the private credit market is to avoid any interference in the establishment of the price of credits and to set trading rules according to environmental criteria. If there were excess profits in private banking, that would act as a short-term and powerful incentive for others to enter the credit supply business. Expanded competition in that business might be necessary if an adequate number of credits are to be supplied through private banks in the long term. To stimulate competition the regulator should simply

set trading rules and trading ratios which satisfy environmental concerns for project failure, and then let the applicant and supplier bargain over credit prices. The regulators should also allow permit applicants to choose the suppliers they wish to deal with. In the example above, some return above the credit supplier's \$5,000 competitive return might be extracted from permit applicants.

4. Market Area Definition: Using ecological arguments, regulators feel that mitigation bank sites should be as close as possible to the permitted wetland. As a result, for the few private banks currently allowed to sell credits, regulators expressed the need to closely define the geographic area within which credits could be sold. But, an ecological basis for determining the trading area need not be determined in advance of the establishment of the bank. Instead, the trading area might be determined when evaluating each permit application. While in some cases there may be an ecological basis for limiting the geographic area for credit sales, generally narrowing the market area will shift (lower) the demand for credits for any single bank and restrict the possibility that numerous banks will be able to compete to serve any one area.

Other geographic factors which can shift credit demand are the criteria for wetland delineation and for program jurisdiction. Guidelines on these matters define the size of the areas subject to regulation and can affect the demand for permits and then credits. The greater the geographical extent of areas falling within the wetlands regulatory net, the greater the extent of wetland development subject to mitigation requirements. Then, as the scope of mitigation needs expands, the demand for credits at any given price would be expected to increase. While the policy decisions which could expand or contract the geographical area subject to regulation should not be based on creating market opportunities for private commercial banking, nonetheless it should be

recognized that such decisions would affect credit demand.

B. Watershed Planning and Management

The potential for private commercial banking could be advanced if wetland regulation were incorporated into watershed planning. Such planning should integrate regulatory and non-regulatory wetland rehabilitation and protection programs toward the goal of whole watershed restoration. Indeed, an emphasis on watershed planning is now a major theme in water resources management. The attention to watershed planning as a contributor to wetlands management reflects a recognition that many functional values of a wetland area, in a given location, are established by its contribution to a larger watershed system. Considering this reality, it is acknowledged that those wetlands which remain today are often residuals from the development process as much as they are an ideal configuration for the watershed system. Therefore, the mix of wetland areas and types which exist in a watershed today may not be the mix that best serves watershed restoration goals, especially in the face of anticipated development pressures. And, of course, many wetland areas which remain today are functionally degraded. Identification of these conditions in the design of programs to manage wetlands is one purpose of watershed planning.

The regulators and resource agency officials interviewed for this study generally support the integration of the Section 404 regulatory program into watershed planning. Moreover, this theme is incorporated by the Administration Wetland Plan, which states:

"Where state, tribal, regional, or local governments have approved watershed plans that address wetlands, EPA and the Corps will give high priority to assisting with the development of categorization of wetland resources for the purpose of Section 404" (White House Office of Environmental Policy, 1993).

Similar attention to watershed planning is being stressed in several different bills which have been offered in Congress for the reauthorization of the Clean Water Act. If the watershed approach were widely adopted for wetland regulation, it would be a departure from the current tendency to separate the regulatory program from broader resource management programs.

There are two contributions of watershed planning to the viability of private commercial banking. First, watershed planning could reduce the prospect of restoration project failure. If the plan identifies the long term presence of conditions which surround and affect a private mitigation bank site, then the placement and design of such sites would be improved. Such boundary conditions are often critical to the long term success of wetland restorations. If private banks were sited according to watershed plans, then bankers might be required to bear lower cost liability for project failure.

Second, the existence of watershed plans would pave the way for adding flexibility in the regulatory program through the development of the wetland categorization systems. In particular, the mitigation sequencing rules at the level of the individual permit might be relaxed for certain wetland types in certain locations. In general, one category of wetland would be those of exceptionally high ecological value to the watershed, with functions that are costly or difficult to replicate. Avoidance is the best management strategy for these areas and only the most obvious water-dependent and high-value development would be even considered for a permit. Such wetlands would be identified in watershed plans.

Another category of wetlands would be wetland sites which currently provide modest functional value to the watershed, or which currently produce high ecological values that would be compromised even if a permit for filling is denied. These are wetlands where cost-effective restoration of functions is possible **and**

where development values might be high enough to secure the financial resources needed to maintain wetland functions through compensatory mitigation. A greater level of flexibility in applying the avoidance and impact minimization requirements than is currently allowed under the mitigation sequencing rules might be warranted here in consideration of the particular circumstances at the site. The areas where this would be the case would also be designated in watershed plans. In this manner, bank entrepreneurs would be better able to relate their assessment of development demand to the wetlands in their areas, and to judge the regional demand for mitigation credits.

Also, from the perspective of private credit suppliers, the current mitigation sequencing rules, which seek to direct development away from all wetlands and which emphasize securing on-site and in-kind mitigation for unavoidable wetland losses resulting from those wetland developments that do occur, will limit the number of permits issued and lower the demand for permits and credits. Conversely, if watershed planning processes make off-site and out-of-kind mitigation more possible for certain wetland categories, this would encourage private commercial banking as a means to meet regulatory goals.

1. Accomplishing Watershed Planning for Wetlands Categorization: Watershed planning for wetlands categorization might be accomplished in the Special Area Management Planning Process (SAMP), in the Advance Identification Program under Section 404 (ADID), or as a part of a separate watershed planning authority under state or regional authority. (A forthcoming study will provide a detailed examination of the opportunities for and challenges of different watershed planning approaches to the potential of mitigation banking.)

ADIDs are planning efforts where EPA, in conjunction with the Corps of Engineers and after consulting with the state, may in advance of permit

applications identify wetlands as generally suitable or unsuitable for discharge of dredged and fill material. ADIDs are authorized in section 404(b)(1) of the Clean Water Act, and are often funded through EPA grants. EPA selects ADID sites based on the perceived need for advance identification; that is, where EPA feels there is likely to be significant development pressure in areas that contain ecologically valuable wetlands. As of March, 1993, there were 71 ADIDs across the Nation, 35 completed and 36 ongoing (Environmental Law Institute, 1993). The size, scope, and degree of local involvement with these ADIDs vary. While ADID areas sometimes correspond to watershed boundaries, this is not necessarily the case. ADIDs can be initiated by EPA, but they can also be requested by state or local entities in order to facilitate local planning efforts. ADIDs are often components of other plans, such as in the case in West Eugene (OR) and Mill Creek (WA). While EPA emphasizes that ADIDs are strictly advisory, the Corps seems interested in using the ADID process to facilitate its permitting process, when allowable. For instance, following an ADID in Lake Co., Illinois, the Corps retracted some nationwide permits that had allowed certain activities in some of the wetlands that the ADID identified as functionally valuable.

ADIDs are not undertaken to become watershed plans. Rather, they merely assess the functional value of wetlands prior to permit applications. An ADID assessment of a site does not predetermine what decision will be made if a permit application is filed, but does give some indication of where fill activities are likely to be allowed. In that sense, ADIDs are thought to be useful to developers as they provide advance warning about where permits are more or less likely to be given. It is also likely that ADIDs are useful to regulators, as they could expedite the review of individual permits by providing regulators with a database of wetland sites and functions. ADIDs are also thought to be useful in preventing inadvertent unauthorized filling of

wetlands, by making landowners more aware of wetlands on their property.

Advance identification of wetlands could also contribute to private mitigation banking, helping bankers assess the likely demand for credits and identify appropriate mitigation sites. However, in some cases ADID projects have experienced problems. The advanced identification process itself sometimes proves difficult due to scientific uncertainty or the sheer geographic area of some ADID sites. Moreover, different interests sometimes voice opposition to a given ADID. Although advanced categorizations are not binding, in some instances landowners believe that advanced identification of sites unsuitable for fill reduces the value of their property. On the other hand, environmentalists and some regulators occasionally oppose advanced identification of wetland sites as suitable for development because they feel the designation encourages development and reduces protection of these wetlands.

SAMPs, established under the 1980 amendments to the Coastal Zone Management Act (CZMA), are "comprehensive plans providing for natural resource protection and reasonable coastal-dependent economic growth." Like ADIDs, SAMPs may or may not correspond to watershed boundaries. However, SAMPs are more comprehensive than ADIDs, and emphasize multi-agency and public participation. Also, unlike ADIDs, approved SAMPs have formal legal status and may serve as the basis for permitting decisions. Although SAMPs apply only to the coastal zone, the Corps has applied the SAMP procedure in inland areas. The Corps feels it has the authority to do this based on section 404 of the Clean Water Act, which gives it authority to grant general permits for certain activities. In general, the Corps participates in the development of SAMPs when there is: 1) significant development pressure in environmentally sensitive areas; 2) local involvement; 3) a participating local agency; and 4) an agreement of all parties on the outcome

of the plan. It appears that this fourth point has proven the most difficult to obtain; often there is disagreement among agencies and among property owners, commercial interests, and environmental groups.

SAMPs are potentially useful to mitigation banking in ways similar to ADIDs. SAMP plans could categorize wetlands. However, in the SAMP case, once accepted, categorizations would be

binding. This would add certainty to any mitigation banking element of plans (if one is included) if a wetland category specifies that mitigation can be met through banking. For example, the West Eugene Wetlands Plan, described by the Corps as a "SAMP", is expected to establish wetland categories which specify those areas which will receive permits if they purchase credits from a (public) mitigation bank.

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V. CONCLUSIONS: REGULATORY RULES TO FACILITATE PRIVATE COMMERCIAL BANKING

The message of this report is that private mitigation credit markets could help the Federal wetland regulatory program achieve no-net-loss of wetlands by increasing the opportunity to obtain successful compensatory mitigation for permitted wetland losses. Private credit markets could promote this result in two ways. First, credit markets would provide the means to secure mitigation for the many small wetland impacts that would otherwise go unmitigated. Second, the use of private credit market systems as an alternative to on-site mitigation in certain cases could enable regulators to circumvent the several sources of failure associated with the on-site mitigation option.

This private market alternative is the next step beyond the recent intense interest in traditional, "single-user" mitigation banking arrangements. Private credit markets, if carefully structured, can offer a competitive return on investment for credit suppliers and an expedited permit review process for qualifying wetland developers. Most importantly, credit trading systems that insure against the risk of mitigation failure would benefit the public by advancing achievement of the no-net-loss and net gain wetland goals.

All the various stakeholders in wetland regulation seem to agree that compensatory mitigation is not working well in practice and that the time is ripe for improvement. Practical evidence of the desire for change is provided by the two newly-permitted and the dozen or so emerging private commercial banks across the country. At the policy level, some states and localities have already passed legislation authorizing private credit markets and are currently struggling with developing regulations for their establishment and use. While Federal government policy has not motivated these developments, recent proposals for policy reform in both the

executive and legislative branches support the general concept of mitigation banking.

At this point, the widespread emergence of private credit markets depends to a large extent on policy guidance which clarifies what is expected of entrepreneurs regarding the establishment and use of private commercial mitigation banks. Clarification of the types of bank conditions and trading rules expected under the regulatory program would eliminate much of the uncertainty currently facing prospective credit suppliers. Meanwhile, changes to the regulatory rules might also be part of an effort to facilitate private banking.

The Corps and EPA jointly issued interim guidance in August 1993 to help guide field staff in the negotiation of mitigation banks. The final guidelines will need to focus attention on the general needs of commercial mitigation banks, which pose somewhat different challenges than single-user banking arrangements.

National guidance should give individual regions the flexibility to produce regional guidelines specific to their own watershed needs, which in turn would increase the certainty for prospective credit suppliers in those areas. Of course, regulators in the field must provide information to prospective credit suppliers on the general process and steps required for the regulatory approval of private commercial mitigation banks and credit sales. Specific factors that must be addressed *if the establishment of conditions favorable to private commercial banks is an objective of regulatory policy* are summarized below.

- *Timing of Credit Marketability* -- Regulators may need to relax the preference for "advanced" mitigation in order to overcome the financial constraints of bankers. A

decision to relax this requirement should be considered when the bank site and mitigation plan and expertise are likely to produce a successful mitigation project and when there are rules established to limit failure risk and allocate cost liability for failure.

- *Performance Standards* -- Performance standards should be required in order to determine when a bank mitigation parcel is failing or has failed. However, these standards should provide some leeway to account for less-than-extreme natural events which may cause a bank mitigation parcel to evolve along a somewhat different path than originally planned.
- *Monitoring and Maintenance* -- Bankers should be required to perform site monitoring and repair any detected deficiencies regarding site construction and performance. However, the monitoring and maintenance period should be limited to a reasonable time frame.
- *Long-term Management* -- Regulators should require mechanisms to ensure that bank sites retain their wetland status into perpetuity, and receive active long-term management if necessary.
- *Cost Liability Rules (Financial Assurance)* -- Concern for project failure may require the use of mechanisms to ensure that bankers face cost liability for non-performance with contract requirements. However, bankers should not be held responsible for extreme events which prevent them from fulfilling contract requirements. Further, the level of cost liability imposed on a bank should be based on realistic estimates of failure probability and the public sector's expected repair cost for that bank, which would be a function of bank circumstances and the stringency of other trading rules imposed.
- *Credit Valuation* -- The determination of how credits are defined and evaluated for the

purpose of determining trading ratios should be based on case- and area-specific factors. Any number of approaches might be employed.

- *Consistency of Mitigation Requirements* -- The wetland policy and programs of the regulatory agency should have similar quality control standards for all mitigation projects, whether done on-site or off-site through mitigation banks.
- *Pricing of Privately Supplied Credits* -- The price of credits sold by private commercial banks should be established through agreements between credit suppliers and permit applicants. It is the responsibility of the regulator to set the trading ratio so that the environmental goals of the agency are advanced with a high degree of certainty.
- *Pricing of Publicly Supplied Credits* -- Public commercial banks or in-lieu fee systems are alternative ways to offer compensation. These public options should be required to charge prices equal to the full cost of creating mitigation credits. Careful auditing and accounting procedures should be required of publicly financed commercial banks and in-lieu fee systems.
- *Trading Area* -- The types and sizes of wetland development projects that may use banks, and the geographic range of bank service area, should be determined according to area-specific factors for each fill permit.
- *Watershed Planning for Bank Siting and Design* -- Regulators should use watershed plans to ensure that the siting of banks and bank design and construction plans contribute to local watershed goals.
- *Watershed Planning to Achieve Wetlands Categorization* -- The categorization of wetlands to establish their functional significance in a watershed should be

advanced through watershed planning. Once accomplished, this would enable the regulatory program to relax the mitigation

sequencing requirements for those wetlands which have been characterized in watershed plans as suitable for mitigation trading.

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APPENDIX I. CREDIT VALUATION AND TRADING

Central to compensatory mitigation of wetland impacts is (1) the need to evaluate and express the ecological worth of replacement wetlands in measures of mitigation credits, and (2) the need to determine the number of credits needed for any bank trade to provide the required compensatory mitigation for permitted wetland impacts. The first need can be termed "credit valuation" (or crediting), while the second can be termed "credit trading" (or debiting). This Appendix discusses key conceptual issues relating to these needs.

A. Credit Valuation

1. **Valuation Principles:** A mitigation credit is a unit of measure of the increase in wetland functional value achieved at a wetland mitigation site (over the functional value of the site if no mitigation were to be effected). Mitigation credits serve as the unit of exchange for provision of compensatory mitigation. Protocols to assess the functional value of replacement wetlands, as well as to establish functional losses at the permitted site, are critical for determining the acceptability of any bank trade. Without such protocols the appropriate credit requirements for a bank trade cannot be evaluated, and therefore, it is not possible to be confident that regulatory goals will be achieved through credit trading.

As the Section 404 program has grown, advances in the sophistication of methods for wetlands functional assessment have followed. However, the state-of-the-art in wetlands assessment is still experimental and somewhat controversial. Wetland functions are difficult to measure individually or cumulatively in any qualitative or quantitative way, and there is no one generalized or "correct" assessment methodology that is applicable to all wetland types and landscape settings. Nevertheless, the existing

mitigation experience shows that creative ways can and have been found to directly or indirectly assess wetland functions in order to perform the credit valuation task.

Theory and practice suggest that the primary guiding principle for the development of credit valuation protocols for any bank relates to the needs and goals of the applicable watershed (as determined by resource managers and regulators), and the specific ways in which the bank intends to contribute to their achievement. Since watershed goals vary from area to area, and the specific ecological objectives of banks vary from bank to bank, one would expect each commercial bank to have its own, somewhat unique, credit valuation protocol tailored to the wetland functional values of interest in the watershed.

Another consideration for the development of credit valuation protocols relates to the difficulty and expense of applying direct functional assessment methods. In general, the more technically sophisticated and comprehensive the functional assessment method used, the greater will be the cost and complexity of the credit valuation task. Since the precision of wetland functional assessments do not necessarily move in lock-step with the degree of methodological sophistication, banks often choose to focus on in-kind trading of like wetland types to facilitate the use of more simplified assessment approaches for credit valuation.

The need for banks to establish cost-effective credit valuation protocols based on watershed- and bank-specific mitigation goals means that there are as many ways in which credit valuation can proceed as there are different banks. And since credit valuation protocols will vary across banks, so will the units in which credits are defined (i.e., the credit "currency"). This is because credit

currency is largely determined by the functional assessment method used for credit valuation. Depending on the assessment method used, bank credits might be defined in terms of, for example, some integrated index of wetland functioning, habitat units, or acres of like wetland types.

While credit valuation protocols and credit currency will vary from bank to bank, there must be consistency in the way credits are evaluated and defined across all uses of any *particular* mitigation bank. That is, the application of a credit valuation protocol to evaluate and express the ecological value of bank replacement wetlands in mitigation credits will determine the baseline methodology and currency in which all trades from that bank should be evaluated.

2. Valuation Techniques: Credit determination methodology can be categorized into four approaches: inventory, subjective scoring, production/diversity indices and measures, and function evaluation methods. Inventory only gives area as an output, the other three approaches can give area or function units such as habitat units (HU's).

(a) Inventory. An inventory approach produces measures of wetland area (acres, hectares) with no indication of wetland quality. However, if more than one wetland type exists and the inventory is stratified by type, special attention can be given to preferred or sensitive types. Alternatively, a bank can be stratified by quality using another approach such as subjective scoring, then area calculated for each stratum. Classification of wetlands into type can include combinations of types to focus on and characterize a wetland complex, e.g., wooded wetland with associated scrub shrub area.

(b) Subjective (Expert) Scoring. This involves use of experts and best professional judgment. If best professional judgment is used, one or more individuals familiar with the wetlands in the bank and in the impacted wetland determine the relative quality of each area. This approach is very

subjective, but attributes of documentation and consistency can be improved by adding some structure to the scoring.

(c) Production/diversity indices and measures. Data collected on wetland function production can be used to determine credits and debits when interpreted with area. For instance, a measure of species richness or volume of flood water retention can give relative ratings on wetlands or can be standardized for direct comparison. One approach with potential for use in wetlands is the Index of Biotic Integrity which was developed for aquatic systems; it has components of species richness and system health.

(d) Function evaluation. Function evaluation methods examine the ability of the wetland to produce selected functions. Unfortunately, the technology to support regulatory requirements to consider multiple functions in wetland decisions is incomplete, but two methods are generally used.

The Wetland Evaluation Technique (WET) can provide a qualitative rating of high, moderate, or low on up to 11 separate functions such as floodwater alteration and aquatic diversity/abundance, indicating a probability level that a wetland is able to provide the function. WET was designed to provide an initial, rapid assessment of functions. It is intended for users who do not have an interdisciplinary team of wetland scientists on hand. It serves as a checklist to help users consider multiple functions, and as a method of examining functions of wetlands in a relative fashion.

WET was not designed to provide quantitative results as the ratings are in the form of ordinal data and cannot be mathematically manipulated. The magnitude of difference between a wetland rated "high" in sediment retention and one rated "moderate" is unknown, and not necessarily the same difference as that

between "moderate" and "low". The magnitude of production of a function is also unknown. WET was not designed to combine function ratings into one overall wetland score. As it currently exists, WET does not incorporate temporal considerations.

The Habitat Evaluation Procedures (HEP), developed by the US Fish and Wildlife Service with the assistance of several Federal agencies, quantify fish and wildlife habitat. HEP produces HU's based on multiplying habitat area by an index of habitat quality (Habitat Suitability Index (HSI)) for selected fish and wildlife species or other evaluation element of interest such as a species life stage. Additional calculations in HEP produce Average Annual Habitat Units to incorporate changes in habitat quality and quantity over time.

Benefits of HEP include its quantified results, the structured process, encouragement of a team approach to the evaluation, and the ability to tailor an evaluation to a specific location and important resources. Any fish or wildlife species or community in any ecosystem may be evaluated, once the appropriate models are constructed. However, HEP quantifies only fish and wildlife habitat.

The utility and quality of a HEP application depends equally on accurate delineation of acreage and determination of HSI scores. Habitat Suitability Index models do not incorporate several factors such as climatic factors, interspecies relationships, and human interference. Judgment must be applied for the consideration of these factors.

HEP itself is a well-established and tested process, although an insufficient number of single-species Habitat Suitability Index models exist to cover the United States. Those models published by the U.S. Fish and Wildlife Service number 130; of the 88 non-aquatic models, about half are for species that use wetlands. However, many additional models exist locally. Further, data on species of interest are often available, the

techniques for constructing and modifying models are available, and there are alternative ways of deriving an HSI score besides using an HSI model.

HEP has many precursors, and there are several modifications. The most common modification is an alternate way of deriving the index of quality (HSI), e.g., the Missouri HEP which uses wildlife models built for land use and wildlife management purposes. There is also a fisheries version for the Missouri area called Aquatic Habitat Appraisal Guide. The Habitat Evaluation System (HES) and a 1976 version of HEP were designed to determine habitat quality for multiple species in a given land use cover type. HES, designed by the U.S. Army Corps of Engineers, examines an entire wetland for the structural indicators of habitat rather than selecting species themselves as function indicators. Thus, the output, is a single-score "wetland quality index."

In order for a wetland mitigation bank credit currency to work it must be able to represent a sufficient range of values and functions and yet be simple to determine and to monitor. As described above, none of the existing systems completely fulfill the requirements. The simple systems can overlook critical functions. The multivariate systems lack capability to evaluate every function with same detail as more limited techniques.

The need for a better method by which to evaluate wetland functions has been recognized by Federal agencies. The U.S. Army Engineers Waterways Experiment Station's Wetlands Research Program (WRP) is building a function evaluation method to replace WET that will provide results on a ratio scale and improved accuracy. The new method will mimic the HEP accounting system and the HSI concept with Functional Indices for each function and Wetland Functional Units that incorporate area. The new method will include a hydrogeomorphic

subclassification of wetland ecosystems and identify what functions are performed by each subclass. The WRP will also identify indicators that describe the functions.

B. Credit Trading

Once the ecological value of permitted wetland impacts and bank replacement wetlands have been assessed in the same manner and measured in the same credit currency, it then must be determined how many bank credits will be needed to provide the required compensatory mitigation for the permitted impacts. The terms by which bank credits are traded for units of permitted wetland loss can be termed the "trading ratio" (or compensation ratio). Key issues relating to the determination of the trading ratio for any particular bank trade include questions relating to who should make this determination as well as how and when it should be made.

It is the responsibility of regulators to determine the trading ratio required for any particular use of bank credits as compensatory mitigation in order to ensure that regulatory goals are achieved. The presumption is that regulators will make this decision for each fill permit proposing to use a bank so as to ensure that, at a minimum, mitigation trades result in no-net-loss in the long-term functioning of wetlands in the applicable watershed. In other words, baseline trading ratios should be at least 1:1 for mitigation credits defined in terms of wetland functions.

To illustrate the 1:1 trading ratio, consider the following hypothetical example. Assume that a permitted development project will result in the unavoidable loss of one wetland acre, and the permittee decides to pay a commercial mitigation bank to provide the required compensatory mitigation. Assume further that regulators, using the bank credit valuation protocol, determine that the impacted wetland has twice as much ecological value as that of the bank wetland. The 1:1 trading ratio for credits defined in terms of functional

units, when translated into areal requirements for compensatory mitigation, would thus require two acres of bank wetlands as compensation for the one acre of permitted wetland loss.

Regulators may, however, make the trading ratio for any bank trade higher than 1:1 for three possible reasons. For example, the trading ratio might be adjusted upward to account for the risk of mitigation failure. The use of trading ratios for this purpose was discussed in Section IIIC of the report as one among several possible ways in which regulators might insure against the risk of mitigation failure.

A second reason why regulators may want to adjust trading ratios upward involves possible temporal losses in wetland functioning between the time at which bank wetlands are used as the basis for credit trades, and the time at which these wetlands reach functional maturity. A higher trading ratio for this purpose would thus trade-off less than equivalent functional value in the short-term for the opportunity to obtain a net gain in wetland functioning in the long-term.

Finally based on analysis, regulators may want to adjust trading ratios upward to ensure that bank trades result in no-net-loss in wetland acreage as well as function. For example, it is possible that a bank trade based on a 1:1 trading ratio for credits (as defined in terms of units of wetland functioning) could result in a net loss in wetland acreage while at the same time ensuring functional equivalency. This could happen if the bank wetlands were judged to have greater ecological value than the impacted wetlands, so that when the 1:1 trading ratio for credits was translated into areal requirements for compensatory mitigation, less than one acre of bank wetlands would be required for every one acre of permitted wetland impact. In such cases regulators may choose to adjust the trading ratio upward to ensure no-net-loss in both wetland acreage and function. Moreover, even in cases in which a 1:1 trading ratio would ensure a no-net-loss in both function and area, regulators might dictate higher than 1:1

trading ratios if they sought to achieve net gains in wetland function or acreage through bank trades.

In the commercial mitigation banking context, however, the need for regulators to adjust trading ratios to account for risk and temporal concerns may often be minimal or non-existent. For example, the use of some other mechanism for insuring against the risk of mitigation failure (e.g., performance bonding) would obviate the need to secure insurance through higher trading ratios. Similarly, possible bank requirements for "advanced" mitigation could eliminate potential problems involving temporal losses in wetland functioning. For these reasons, the commercial mitigation banking context should reduce the need for regulators to collapse several considerations into the determination of trading ratios, thus freeing regulators to determine appropriate bank trades based on functional equivalency.

The final consideration for the determination of trading ratios is when this determination should be made. As long as ratios are based on credits defined in terms of functional units, regulators can state up-front that all credit trades involving a particular bank would be exchanged on a 1:1 basis, or some higher basis to account for risk, temporal concerns, or a net gain objective. Then for each proposed bank trade regulators could determine the areal mitigation requirements that would achieve stated objectives. However, in the commercial banking context it does not make any sense to define up-front a set trading ratio for all bank trades if ratios are defined in terms of acres rather than credits measuring wetland functioning. This is because the particular wetland impacts to be compensated for through a commercial bank are not known in advance of trades.

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APPENDIX II. GENERAL INTERVIEW RESULTS

To construct and test the arguments presented in this report, interviews were conducted with prospective bank entrepreneurs and Federal and state field regulators and resource agency officials around the country. A list of the individuals interviewed is provided in the acknowledgements for this report.

An initial interview round was conducted with the entrepreneurs and mitigation consultants backing several proposed banks. The interviews, numbering about 10, were centered along the east and west coasts. A second round of interviews was then conducted with the entrepreneurs and consultants behind approximately one-half of the banks surveyed in the initial round of interviews. Interviews were also conducted with field regulators and resource agency officials who were considering these banking proposals. The banks chosen for the second round interviews included two--the Millhaven Plantation Bank (Georgia) and the Florida Wetlandsbank--which received Federal regulatory approval during the course of the study and are now operating, the proposed Neabsco Wetland Bank (Virginia) which is in the final stages of negotiation, and several other prospective banks which are in various stages of the planning and negotiation process but which appear far from regulatory approval. In order to preserve confidentiality and not color the negotiation of the proposed banking ventures, only the three banks cited above are mentioned by name.

The interviews were conducted to gain insight about the barriers to widespread establishment of private commercial mitigation banking and ways in which they might be overcome. The general themes uncovered in the interviews are reflected in the study conclusions and recommendations provided throughout this report. This appendix discussion includes brief summaries of the perspectives of

each of the relevant groups--bank entrepreneurs, field regulators, and resource agency field staff. The summaries explore each group's general expectations and concerns regarding:

1. Nature of the enterprise
2. Mitigation site, plan, and expertise
3. Timing of credit marketability
4. Balancing of trading rules
5. Credit valuation and trading.

The summaries conclude with a review of the relevant group's general perceptions regarding the opportunities for, constraints to, and risks of private credit market systems.

A. Bank Entrepreneurs

The entrepreneurs who have developed or are seeking to develop private commercial mitigation banks include: (1) those that wish to establish themselves regionally or even nationally in the credit supply business (i.e., those who wish to open large scale banks or bank chains), and; (2) those seeking to open a single commercial bank on lands that they own, and that in some cases may have low development value. The first group generally has sophisticated knowledge of wetland regulations and is keenly aware of the need for more ecologically successful mitigation and the demand for readily-available mitigation. Based on this knowledge and the encouragement of local regulators, these entrepreneurs have identified commercial banking as a new profit-making opportunity and have pulled together the mitigation expertise and capital necessary to get it done. Although there are exceptions, these entrepreneurs generally have sought out bank sites that are favorable for mitigation success, have purchased or leased these lands, and have developed carefully thought-out mitigation plans that provide

Appendix II

General Interview Results

for diversity and biological integration with surrounding areas. For example, the Millhaven Plantation Bank and the Florida Wetlandsbank, the owners of which hope to expand their interests in the credit supply business, share these characteristics.

The entrepreneurs in the other group have also identified local demands for mitigation credits, but they seem more opportunistic in the sense that they are trying to make the best use of lands they already own. In general, these entrepreneurs have sites which are much smaller and in some cases less favorable for mitigation success than those of the entrepreneurs seeking to become credit suppliers on a large scale. Moreover, with some exceptions, these entrepreneurs appear to have less mitigation know-how and experience, and face more restrictive resource constraints. The narrow focus on particular mitigation sites and other constraints may limit the ability of these entrepreneurs to develop mitigation plans and agree to trading rules that will satisfy regulators.

With regard to the negotiation of trading rules, there is widespread agreement among entrepreneurs regarding bank rules for the timing of credit marketability. Virtually all of the entrepreneurs interviewed for this study argued that their banking ventures would not be economically viable if they were not allowed to sell credits until functioning or self-maintaining replacement wetlands had been achieved at bank sites. While some entrepreneurs said they could operate if credit sales were restricted until the point at which mitigation construction for some phase was complete or soon thereafter, others indicated that they need the ability to provide mitigation concurrently with credit sales. For example, the owners of the Florida Wetlandsbank successfully argued to regulators that the economics of their venture depends on the ability to use revenues from credit sales to provide the mitigation compensation for those credits.

The one prospective private commercial bank that has so far agreed to provide fully advanced mitigation did so only after negotiating a separate bank provision that would ease the financial burden of the advanced mitigation requirement. The draft MOA for the proposed Neabsco Wetland Bank in Virginia says that credit sales will be restricted until functioning wetlands have been achieved at the bank site; however, the MOA also includes a provision designed to enable the bank to generate cash flow before credit sales are actually made. This provision says that the bank site can be used to provide concurrent mitigation of off-site impacts up to 7.5 acres, but such mitigations would not be considered part of the bank. In other words, a permit applicant would be allowed to satisfy his or her project-specific mitigation needs by paying the banker to concurrently create equivalent wetland acres at the bank site, but these replacement wetlands would not be recorded as bank credits or debits.

In addition, the draft MOA for the proposed Neabsco bank does not include any cost liability for mitigation failure (i.e., financial assurance) for advanced mitigations on which credit sales will be based. Similarly, the owners of the Florida Wetlandsbank were able to secure a provision which says that the performance bonding requirement for bank mitigations that are done concurrently with credit sales is waived in the case of any credit sales based on advanced mitigation.

The trade-off between rules for the timing of credit marketability and other trading rules, particularly that for failure liability, illustrate bankers' concerns about potentially redundant bank requirements that they believe would eliminate the economic viability of credit market systems. Bank entrepreneurs note that on-site mitigation efforts are typically not held to advanced mitigation nor financial assurance requirements. The bankers feel that if regulators create a double standard with regards to both types of trading rules, they will

choke off the opportunity for an ecologically superior alternative to on-site mitigation.

While the prospective bankers are adamant about the need for flexibility regarding the timing of credit marketability, they generally appear willing to agree to other trading rules—including cost liability for project failure—that regulators might want to impose to limit and allocate the risk of mitigation failure. Most bankers say they will agree to standards for performance, monitoring and maintenance, and financial assurance if these requirements are reasonable in light of bank circumstances and if they are in force for a reasonably limited period of time (e.g., 5 years).

There is one important operational issue which has been the subject of disagreement between some prospective bankers and regulators: credit valuation and trading. A number of entrepreneurs express the view that the credit supply business depends on having a set methodology for evaluating credit worth and determining how many credits are required for any particular trade. For example, the owners of the Florida Wetlandsbank successfully argued to regulators that they need a standard credit/debit method in order to provide upfront cost estimates to potential customers for satisfying their total mitigation needs through the bank. However, other bank entrepreneurs do not feel strongly about this issue. The permit for the Millhaven Plantation Bank, for example, gives the local regulator complete discretion to use any method to determine functional values and trading ratios on a case-by-case basis.

For the most part, the bank entrepreneurs interviewed for this study are knowledgeable about wetland regulations and have spotted the profit-making opportunity available to those who can efficiently provide high-quality, off-site mitigation. Bank entrepreneurs have identified several sources of demand for bank credits, including applicants for individual and/or general permits (particularly Nationwide 26 permits) under the Section 404 program, and state permits for wetland impacts that fall outside Federal jurisdiction. Some prospective

bankers are even tailoring their banks to serve particular types of regulatory permits to avoid the jurisdiction of certain government agencies that they feel are opposed to private credit market systems.

The desire of some bank entrepreneurs to avoid dealing with certain government agencies illustrates one of the major frustrations voiced by prospective credit suppliers. In general, bank entrepreneurs are pleased with the cooperation and encouragement provided by Federal and state regulators, although some prospective bankers say that Corps field offices are too understaffed to deal with bank negotiations in a timely manner. However, many of the bank entrepreneurs single out one or more of the Federal resource agencies (i.e., Environmental Protection Agency, Fish and Wildlife Service, and the National Marine Fisheries Service) as unresponsive or even hostile to bank proposals and generally against the concept of commercial banking. Bankers hypothesize several possible reasons for the perceived opposition by resource agencies—they have a larger agenda of trying to completely stop wetlands development; they are against anyone realizing a profit as a result of the regulatory program; they fear that the reality of successful off-site mitigation will compromise the mitigation sequencing requirements of the regulatory program.

In addition to these perceived barriers to entry into the credit supply business, many existing and prospective bankers point to certain extra-market risks facing banks once they become operational. One is the risk of regulatory change. Since the existence and structure of private markets in mitigation credits depend on regulatory policies, future policy changes could ruin the best laid plans of bank entrepreneurs. Another risk involves the on-site mitigation option: bankers express the fear that if regulators continue to give preference to on-site mitigation and allow it to be done "on-the-

cheap", this will depress the demand for bank credits based on high-quality, off-site mitigation. Similarly, some bank entrepreneurs are beginning to see a potential threat from recent government interest in publicly owned and operated commercial mitigation banks and in-lieu fee systems. The risk noted here involves the possibility that governments will subsidize the production of mitigation credits and end up offering credits for sale at prices which undercut private banks.

B. Regulators

Many of the regulators interviewed for this study were associated with recently approved banks and banks that are nearing final approval. Not surprisingly this subset of regulators generally voice strong support for private commercial mitigation banking. They see specific benefits from the opportunity to use private banks to secure more ecologically successful mitigation in cases involving small wetland impacts. However, there seems to be receptivity among all regulators to banking proposals.

Although they are working in the absence of explicit policy guidance, regulators appear fairly consistent in what they expect of private bank mitigations. First, regulators generally want relatively large areas of diverse replacement wetlands, including upland islands and buffers, that are well-situated for biological integration with surrounding areas.

Second, regulators expect bank mitigations to involve primarily the restoration of former or severely degraded wetland areas; wetland creation and enhancement are typically viewed as acceptable supplemental features of bank mitigations if they fit well with wetland restoration plans. Regulators have much more confidence in the long-term viability of bank mitigations that rely on the use of former or degraded wetlands areas where the underlying hydrology is intact or can be relatively easily restored to a self-maintaining

status. By contrast, many regulators are wary of wetland creation efforts, particularly if the water flow must be artificially supplied and/or maintained.

Finally, regulators expect bank entrepreneurs to use mitigation consultants who have specialized expertise and experience in the design and construction of wetland restoration projects. Regulators appear to be particularly skeptical of prospective banks that are proposing to use mitigation consultants who do not have prior experience or a good track record with designing and constructing mitigation projects under the regulatory program.

Regulators have forged ahead with the negotiation of bank proposals that meet the criteria outlined above, but they have been much less willing to negotiate with prospective bankers who resist fashioning bank plans to satisfy these criteria. In cases in which regulators believe that bank sites or mitigation plans are fatally flawed, or the proposed mitigation contractor is unqualified, bank negotiations have not proceeded very far.

In general, those prospective bankers who are seeking to establish large-scale banks, have actively searched for favorable sites, and have the necessary mitigation expertise have been warmly received by regulators. However, the study interviews uncovered one prospective banker who wanted to establish a nationwide chain of banks but whose plans regulators were concerned about. Regulators (and resource agency field staff) were apprehensive because this entrepreneur had developed and distributed promotional material that implies that the firm had one ongoing, successful mitigation bank although the firm had not in fact secured Federal or state permission to create and sell credits. Regulators also appear to be particularly wary of those who they believe are just trying to profit from lands that have low development value but may not be particularly favorable for mitigation success.

Regulators appear to be very flexible about rules for the timing of credit marketability for those bank proposals that they view favorably. Although regulators express a preference for advanced mitigation, they recognize that requiring replacement wetlands to be fully functional before credit sales are permitted would in most cases eliminate the economic viability of private credit market systems. Accordingly, they generally agree with the call for flexibility in the timing issue of credit sales in order to get private commercial banking off the ground. Generally, regulators are willing to allow credit sales immediately after the completion of a mitigation phase or soon thereafter. However, some appear willing to allow even earlier credit sales if they have a good idea of the type and quantity of wetlands that will result from bank mitigations, and if there is a low probability of project failure.

In exchange for allowing early credit sales, regulators expect private banks to agree to a set of bank requirements and trading rules to limit and allocate the risks of project failure. Regulators want bank permits to include success criteria (i.e., performance standards) for bank mitigations, monitoring and maintenance requirements to uncover and correct deficiencies, and provisions to ensure long-term status of mitigation sites as wetlands. Regulators also expect bankers to assume financial responsibility for mitigation failure; however, regulators recognize that rules for allocating cost liability must be reasonably related to failure probability and repair costs for each case. Thus, for example, regulators seem willing to waive financial assurance requirements if banks provide advanced mitigation for credit sales. In addition, regulators seem to recognize that bankers should be held to trading rules for performance, monitoring and maintenance, and cost liability for failure for a reasonably limited period of time.

One trading rule that regulators generally view as non-negotiable involves the techniques to be used for valuing credit worth and making trade-

offs between banked and permitted wetlands. With one notable exception (in the case of the Florida Wetlandsbank), the regulators interviewed for this study express the need for flexibility to evaluate bank mitigations and determine trading ratios on a case-by-case basis. Regulators generally do not think that any one of the available functional assessment methodologies are adequate for evaluating the relative worth of impacted and replacement wetlands. Consequently, regulators say they need to be able to use all available methods and resources for evaluating credit worth, including "best professional judgement", as well as the flexibility to adjust trading ratios to account for differences in quality and maturity between banked and impacted wetlands.

Regulators generally see great utility from private commercial mitigation banking provided that banks meet the conditions and criteria outlined above. However, regulators view commercial banking as appropriate in limited situations--specifically for small wetland impacts such as those permitted under Nationwide 26 permits or that fall outside Federal regulatory jurisdiction. Regulators do not seem enthusiastic about using private banks to secure compensatory mitigation in cases of individual permits involving large wetland impacts; almost all of the regulators interviewed for this study believe that on-site mitigation should be required in such cases. Additionally, regulators generally do not view banking as appropriate in areas which have little remaining wetlands.

Further, regulators express support for the mitigation sequencing rules required under Federal wetland regulations. They feel that the existence of bank replacement wetlands should not affect the current responsibility of permit applicants to first make all practicable efforts to avoid and minimize wetland impacts. When prompted, regulators acknowledge that more flexibility in mitigation sequencing rules might be appropriate if the regulatory program were integrated with local watershed planning initiatives. However, some

were skeptical about the ability to effectively promote this outcome.

When asked about the claim by bank entrepreneurs that the resource agencies pose a barrier to private credit market systems, the regulators interviewed offered somewhat differing perspectives. Some indicate that they do not believe the resource agencies are against the general concept; rather, these regulators feel that the resource agencies just want to make sure that commercial banks ensure ecological success. One regulator, however, said that the resource agency field offices in his area were against the concept for various reasons, including a distaste for anyone profiting from wetland regulation. Given these perspectives, regulators generally indicated that were seeking to negotiate bank agreements and largely finalize contract language before proceeding to the resource agencies for review and comment.

Finally, when asked about the potential utility of publicly owned and operated commercial mitigation banks, regulators note a number of risks with this mitigation option. Regulators cite potential problems with financing and management, and also echo the main concern of bank entrepreneurs: that public banks might actually end up subsidizing wetland development and undercutting private banks.

C. Resource Agencies

The resource agency staff in the field offices generally show cautious support for the use of private commercial banking to secure compensatory mitigation in cases involving small, isolated wetland impacts. At the same time, however, they see many potential problems and risks with commercial banking that they feel must be carefully accounted for in individual bank agreements. Many resource agency field staff seem to trust regulators to adequately deal with such problems and risks in the negotiation of bank agreements. For this reason, most resource agency

field offices have not been actively involved with bank negotiations, although one did work closely with the regulatory authorities in the negotiation process for the Millhaven Plantation bank.

Resource agencies appear to want much of the same things that regulators require concerning bank siting and mitigation plans. They specifically note that bank sites should already have largely intact hydrology, and thus favor the use of former wetland areas such as prior-converted farmlands for bank siting. They also express the need for upland buffers at bank sites, and the view that such buffers should not be the basis for bank credits. Further, resource agency officials feel strongly that bank mitigations should not involve wetland creation for a number of reasons, including: 1) the need for bank mitigations that are self-sustaining; 2) a general belief that wetland creation doesn't work; and 3) the view that uplands should not be used to produce wetland mitigations.

Resource agency staff feel very strongly that credit sales from private commercial mitigation banks should be based on advanced mitigation if at all possible. However, based largely on the arguments of regulators, most now see that the economic viability of private credit markets depends on some form of early credit sales in most cases. In return for early credit sales, the resource agencies expect bank agreements to include stringent trading rules to limit and allocate the risks of mitigation failure.

Resource agencies feel, as do regulators, that bank agreements should include well-specified performance standards, monitoring and maintenance requirements, and provisions for long-term site management that ensure bank sites will remain as viable wetland areas into perpetuity. However, they generally are more cautious with respect to such requirements than many of the regulators interviewed for this study. For example, although resource agency staff are generally satisfied with the bank provisions and trading rules

written into the Federal permits for the Millhaven Plantation bank and the Florida Wetlandsbank, some are uncomfortable with certain aspects of those agreements.

The way that long-term site management was handled in the permits for the two banks provides a case in point. The entrepreneurs behind the Millhaven Plantation bank lease the bank site from a private landowner that has on-going forestry operations on adjoining lands. The Millhaven bank agreement is contingent upon a conservation easement on the bank site into perpetuity that allows the landowner to perform selective timber cutting at the bank site subject to certain conditions designed to prevent harm to bank wetlands. One resource agency staff member expressed concern that such activities could compromise the long-term viability of bank wetlands.

The site on which the Florida Wetlandsbank is located is owned by a municipality. The land was actually dedicated as a wetlands preserve years ago but has since become a degraded and largely non-functioning ecosystem invaded by exotic vegetation. One state resource agency objects to the use of public lands to produce bank mitigations that can be used to offset wetlands development. This agency argues that the use of private monies to restore lands in public ownership could result in a net loss of wetlands in the state. This agency would prefer to see public lands restored with public funds, and private lands restored with private funds.

Resource agency field staff echo the need expressed by regulators for regulatory flexibility to

use any available methods and resources to evaluate the worth of bank credits and adjust trading ratios on a case-by-case basis. They also feel strongly that they should have the opportunity to review and comment on all proposed trades, as they currently do for proposed on-site mitigation plans.

Resource agency staff see benefits from the use of carefully structured private commercial banks specifically for securing compensation in cases involving small, isolated wetland impacts. They generally do not support the use of banking in cases involving more significant wetland impacts, and also feel strongly that banking should not be an option in areas with little remaining wetlands. Resource agency staff stress the need for on-site mitigation in such cases to preserve site-specific wetland functions.

While acknowledging the potential benefits of private credit markets, resource agency staff also see many potential risks. They are very wary of potential opportunistic prospective bankers who they think may try to profit from lands they already own, but who have unsophisticated knowledge of and/or experience with wetlands mitigation. Many also fear that the widespread existence of private commercial banks would lead to pressure to relax the full mitigation sequencing rules of the regulatory program. Although they support integrating the regulatory program with watershed plans, they generally do not think this should provide the basis for more regulatory flexibility. Some mention the risk that localities bent on development might use watershed planning initiatives toward promoting wetland development and not wetlands management.